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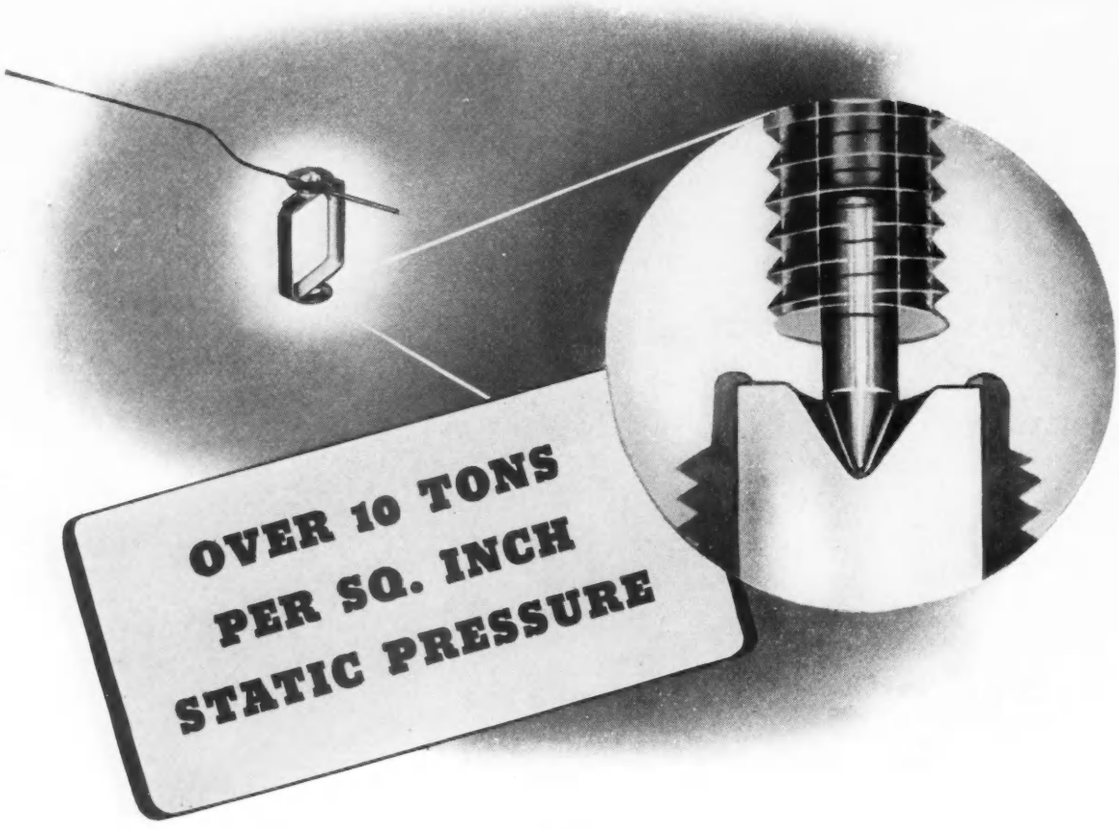
Electrical World

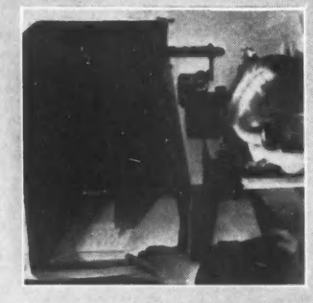
JUNE 27, 1942

"UNITED WE STAND"

WAR BONDS
AND STAMPS
FOR VICTORY



. . . on this tiny Instrument pivot!



Here the pivot for a WESTON instrument is being scrutinized for exact dimensions by the projection microscope, after meeting all other critical metallurgical standards. The bearings, also, exactly meet high WESTON standards because they, too, are processed and tested by methods which have been perfected through a half century of instrument specialization.

"How is it possible for WESTON so successfully to forestall friction in instrument bearings when the combination of design factors is so critical?"

First let's look at these factors. The bearing may measure only 3/32 in. dia. The tiny steel pivot, supporting a moving coil weighing only 1/100 ounce, may have a point several times sharper than the finest needle. The static pressure between them will exceed 20,000 lbs. per square inch; and the starting torque may only be the result of minute energy produced by a few microamperes. Yet that pivot must swing freely perhaps millions of times during the life of an instrument!

Here, again, the answer is to be found in basic WESTON design, and WESTON control of every step in instrument manufacture. Despite their extreme fineness pivot points for example, are formed to a *true sphere* . . . then the pivots are heat treated by an exclusive process to the exact hardness degree that resists crushing or mushrooming under the tremendous pressures involved. The "V" bearing, too, is carefully checked for precise dimensions and flawless surface by a special optical method which insures perfect operation of pivot and bearing.

But supplementing these and other WESTON methods is the skill of instrument craftsmen who have acquired the "know how" through years of instrument specialization . . . to whom the term "friction-free" is ever an ideal capable of achievement. For only through *specialization* can the superior techniques be developed, the "know how" be acquired, the ideal be so closely achieved . . . to insure that *instruments provide the accuracy and dependability so typically* WESTON . . . Weston Electrical Instrument Corporation, 578 Frelinghuysen Avenue, Newark, N. J.

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June 27, 1942

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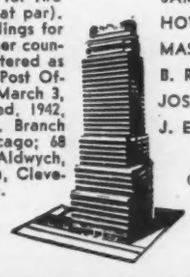

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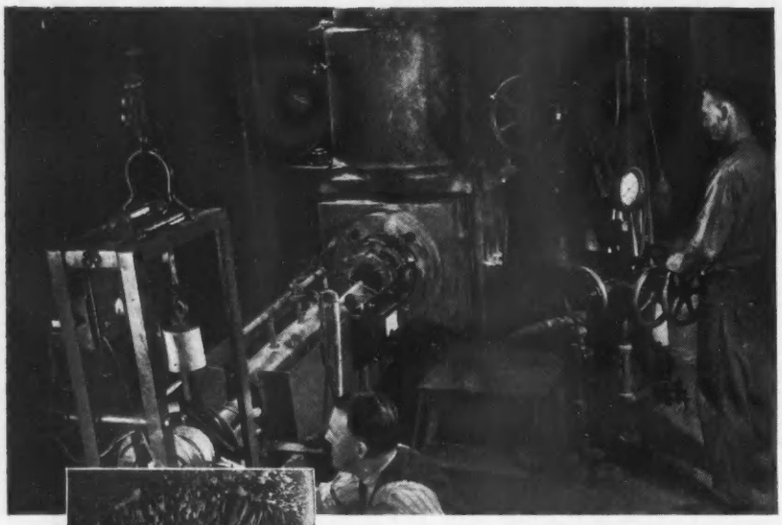
It Took 2 Ideas to...



Blitz the "Bugs" in LEAD SHEATHING

Stabilized lead plus the Hill Standpipe pouring method eliminate laminations and inclusions . . . make lead sheaths for paper insulated cables uniformly strong throughout— another development of

OKONITE-CALLENDER RESEARCH

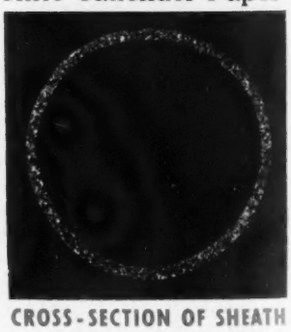
The most common seeds of self-destruction which a cable sheath may contain are laminations (caused by improper bonding of successive lead press charges) and oxides or other inclusions in the lead itself.

Okonite-Callender Research successfully solved this costly and troublesome problem by developing a treated lead (Stabilized lead) that is freed from harmful inclusions . . . and the Hill Standpipe pouring method that assures complete union of old and new charges. Here's proof the lead sheaths that protect Okonite-Callender Paper Insulated Cables stay tight in service.

In five years of experience with this Okonite-Callender technique of lead sheathing, not one lead sheath failure from lamination or inclusions has occurred. Once again, Okonite-Callender Research has set the pace for efficiency of paper insulated cables.

INCOMPLETE UNION
of charges which later leads to cable sheath failure results from the old method of sheathing.

COMPLETE UNION
of charges is obtained by the combination of stabilized lead (freed from oxides and harmful impurities) and the Hill Standpipe method of bottom filling. This filling from the bottom assures uniform knitting of old and new charges — thus eliminates the cause of laminations.



CROSS-SECTION OF SHEATH
from Okonite-Callender Cable. 58 samples from one production length, tested by an independent laboratory, showed no defects of any kind — no flow lines, no "critical" region, no lamination in lead structure.

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OKONITE CALLENDER Paper Insulated Cables

Are We Ready?

Utility engineers have been looked upon as hardy individualists ever resisting standardization, but is this altogether true? The record seems to show an ever-growing amount of standardization. How, then, did the industry get this reputation? It got it partly because in many instances where there were standards some indivdiuals insisted on having odd sizes. Mostly, however, it came from the resistance to standard heavy apparatus.

The engineer said that standardization would stifle development. What he meant was that there was more room for improved efficiency and better operating conditions in individual design than in a standard design. And results have shown a steady curve of improvement.

Has the time now come, however, as was suggested by a spokesman for one of the larger manufacturers at the recent E.E.I. annual meeting, to explore the possibilities for standardization of heavy apparatus? Have we exhausted pretty much all the rich ore of individual design and is our next improvement in efficiency to be found in the lower first costs attendant upon standardization?

In the past there has been no particular advantage to a user to buy standardized heavy equipment. He might get deliveries a little more quickly, but there was no compelling cost advantage. Why, then, should he buy a ready-made when a tailor-made cost no more, especially when he could get his own pet ideas or try out something new?

Standardization of heavy apparatus is not to be confused with ordering a duplicate of something previously made. That will, of course, effect some economies in manufacture, but not the large reductions that are predicated upon mass production. It isn't just two or three made from the same patterns, but a whole lot all the time.

Obviously the manufacturers are in a position to engage in mass production of heavy electrical apparatus or it would not have been suggested. Are they ready to indicate how much the savings to the customer will be?

Of course, standardization will not stop development work. It hasn't stopped it in meters or lamps, so why should it in the heavier equipment? It will move more of the responsibility for development over to the maker, as it has in other lines. The user will continue to be critical, and this, as in other things, will be reflected in improved design. Moreover, the very competitive aspect of the manufacturing field will prevent any stagnation of design.

The benefits of any such program are, of course, all post-war, so that there is now time to explore the economic as well as the engineering significance of such a move. It is not so simple as changing manufacture from tailor-made to ready-made. To make it effective in terms of savings there must be a good load factor of production. That may mean a change in system planning, in that the time interval will be reduced, in which event it might mean the ordering of fewer very large units and more smaller ones. There are many implications in a move like this, and if they can be worked out satisfactorily the results should be of great mutual benefit.

Are we ready yet for standardization of heavy equipment? Let's find out now so we can take advantage of any benefits just as soon as buying is freed from war restrictions.

Heating and Process Steam Influence Iowa Extension

Two-part furnace burning both pulverized coal and refuse and turbine with head-end stage in two sections provide Iowa plant extension with needed flexibility to meet central heating and industrial process steam needs

JOHN M. DRABELLE, Iowa Electric Light & Power Company, Cedar Rapids*

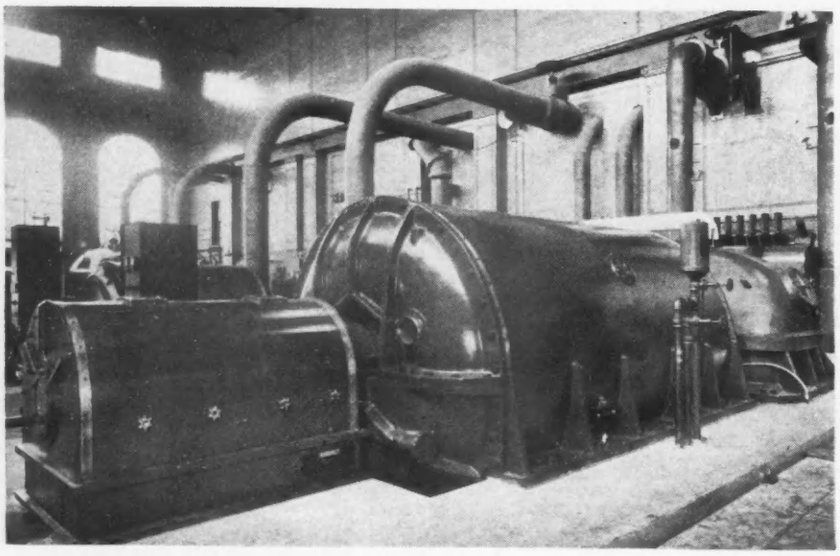


FIG. 1—Iowa turbine has first stage in two sections, one delivering steam for condensing operation, the other providing low-pressure steam for central district heating and industrial process

WITH industrial process steam requirements superimposed on the demands of an extensive central district heating system, flexibility was a vital design requirement in planning the recent expansion of the Sixth Street plant of the Iowa Electric Light & Power Company in the city of Cedar Rapids.

The extension, placed in operation in October, 1941, consists of a 30,000-lb.-per-hour boiler that generates steam at 675 psi. gage pressure, 750 deg. total temperature for delivery to a new 15,000-kw. turbine.

Three of the extension's several unique features contributed particularly to attainment of the required flexibility. They were:

1. A high-pressure boiler with furnace divided in two by a central water wall.

2. A furnace designed to burn pulverized bituminous coal and simultaneously pulverized refuse of a chemical process from a nearby cereal mill.

3. A turbine with its head end or first stage in two sections; one section supplying steam to the condensing section of the turbine and the other section operating as a topping turbine, supplying steam at 210 psi. gage, 500 deg. F. for topping the older and low-pressure units in the station, or by a change in the adjustment of the extraction gear to supply steam at 100 psi. for process steam requirements for industrial plants located near the generating station. As shown in the accompanying flow diagram, four steam pressures exist at Cedar Rapids plant, 750 and 210 for turbine operation, 100 and 5-15 for industrial, central district and feedwater heating by extraction.

Two high-pressure boilers supply 750-psi. steam to the new 15,000-kw. extraction condensing unit (No. 4) and to a 6,000-kw. non-condensing unit (No. 3) exhausting to the 210-psi. header supplying low-pressure turbines. Eight low-pressure boilers also supply 210-lb. steam.

Steam Demand

Prior to installation of the present extension (No. 4) district heating steam was supplied at 100 and at 5-15 psi. by extraction from a 6,000-kw. (No. 2) low-pressure non-condensing turbine, which also supplied 100 psi. steam for industrial process. This arrangement lacked flexibility essential to meet fluctuating steam demands.

Consequently, when No. 4 unit was added provision was made to relieve the industrial and heating steam demand on No. 2 unit. The new turbine was provided with a split first stage, from which steam could be extracted at either 200 psi. for topping purposes or at 100 psi. (by change in gear adjustment) to relieve the 100-psi. industrial and district heating steam demands on No. 2.

Steam furnished the central district steam heating system under cold weather conditions reaches a maximum of 180,000 lb. of steam per hour, divided between the two systems—135,000 lb. per hour to the

*Consulting engineer.

low pressure 5 to 15-psi. system and 45,000 lb. per hour to the high-pressure system, operating at 100 psi. gage.

Water Treatment

Because of the large quantities of steam sent out from the station for processing and district heating, with but little condensate returning to the station, boilers are supplied with large quantities of make-up water, reaching under some conditions a maximum of 60 percent.

Source of the make-up water has been changed from raw lake water to a convenient source of partially treated water. This water can be brought to the same degree of purity as lake water at lower cost due to the preliminary treatment it receives. The two water sources can be used interchangeably in an emergency.

However, until water treatment was changed, recently, both water sources deposited dissolved solids on the turbine blades, making washing necessary every five weeks. With the change in water treatment to be discussed, the turbines are washed only about once a year.

Total dissolved solids in the water have not been changed by the new treatment, but rather the relative amounts of the solids have been altered. Formerly the ratio of sodium sulphate (Na_2SO_4) to caustic soda (NaOH) was about 2:1. Both these substances deposit on the turbine blades together; the dry powdery sodium sulphate "building up" on the sticky caustic soda deposit. Increasing the proportion of sodium sulphate to caustic soda from 2:1 to 7:1 had the effect of diluting the caustic soda "binder." With this binder reduced the dry sodium sulphate did not adhere to the turbine blades, as formerly.

Change in ratio was accomplished by reducing the alkalinity of water from 50 ppm. to about 35 ppm. by sulphuric acid treatment. An accompanying illustration shows water treatment log used to record daily quantities of chemicals added to water. On this log has been entered the total quantities of chemicals used at Cedar Rapids during 1940 and 1941.

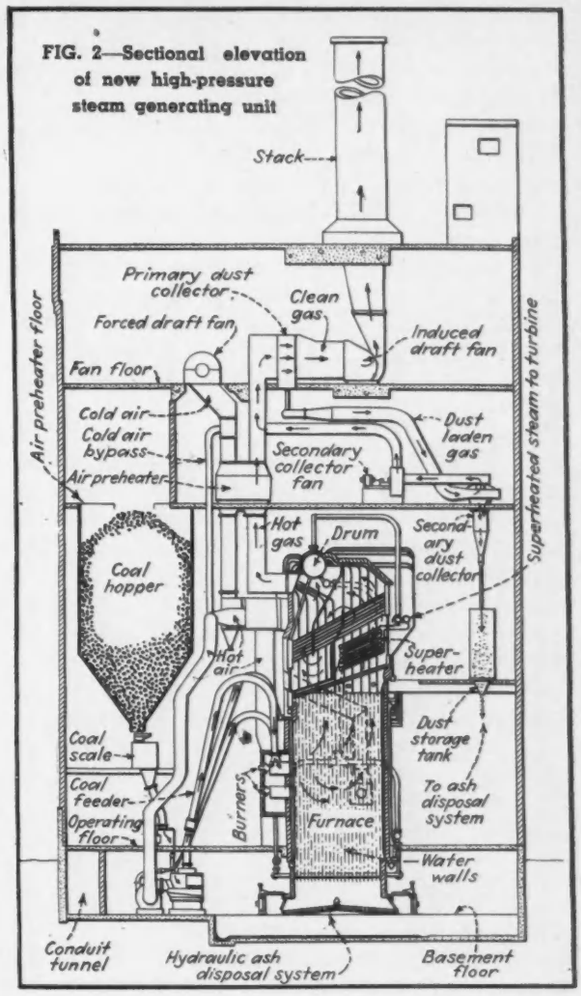


FIG. 2—Sectional elevation of new high-pressure steam generating unit

The feedwater-treating system was laid out by Dr. Frederick G. Straub of the University of Illinois and in brief consists of the following: (1) A sand filter for removing suspended solids in the raw water, (2) a Zeolite

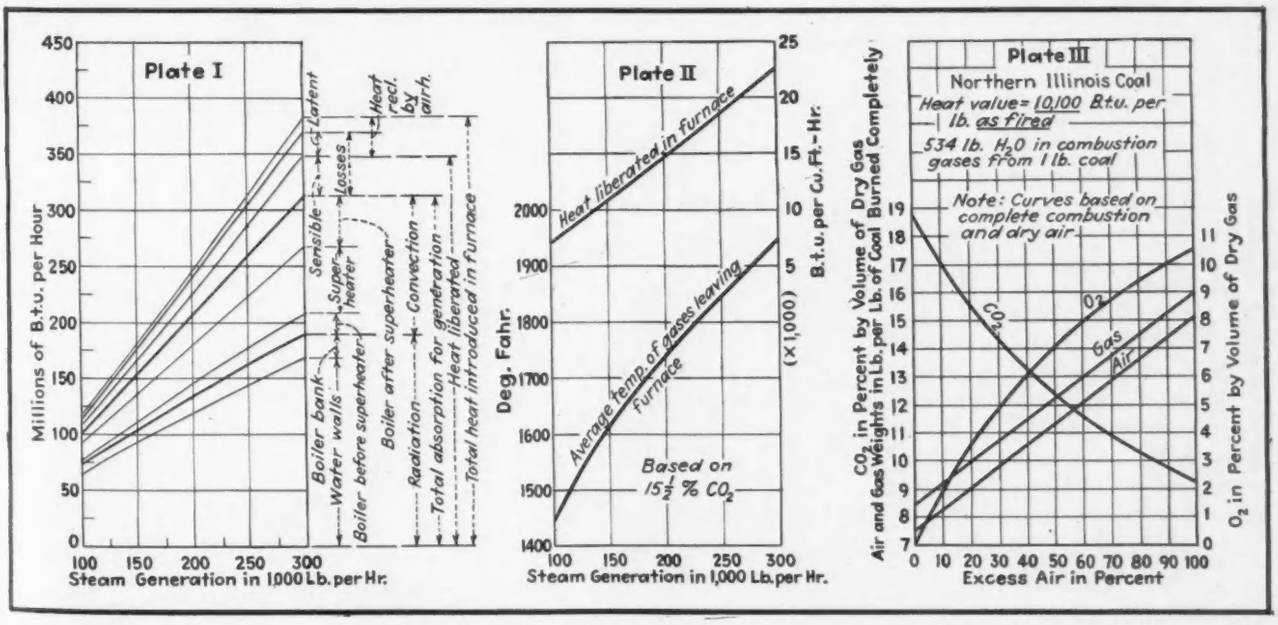


FIG. 3—Performance charts reveal operation of double furnace boiler. Heat absorption in boiler sections is shown by heat distribution diagram (Plate I); heat liberation in furnace and exit gas temperatures in Plate II, and gas weights for various excess air conditions by Plate III

softener for removing scale-forming constituents, (3) a sulphuric acid treatment for changing carbonates to sulphates, with compressed air agitation for removal of CO_2, and (4) a final dose of phosphate fed direct to the boiler drum. The concentration in the drum is now being carried at approximately 1,000 ppm. The blowdown through the flash system approximates 5½ to 6 per cent.

Coal Analysis

The boiler unit was manufactured by the Springfield Boiler Company of Springfield, Ill. The coal supply is from the strip pits of northern Illinois and the shaft mines of southern Iowa, and on account of the low initial deformation point A.S.T.M. of 1,900 deg. F. of the ash a cold furnace was decided upon.

A typical average analysis of the coal used in the high-pressure boiler units at Cedar Rapids power station follows:

Constituent	As Rec'd. Per Cent	Constituent	As Rec'd. Per Cent
Ash	8.24	Volatile	35.62
Sulphur	3.15	Moisture	18.0
Fixed carbon..	38.14	B.T.U.	10.307

Furnace Design

Furnace arrangement is unique in that it consists really of two furnaces under one boiler. Conventional water wall surface is on three sides of each furnace section, and a center or open water wall or partition divides the boiler furnace into two sections. The amount of projected effective surface looking at the fire is given below:

Front walls (2).....	600 sq.ft.
Rear walls (2).....	840 sq.ft.
Side walls (2).....	1100 sq.ft.
Center walls (2).....	1200 sq.ft.
Boiler bank	520 sq.ft.
Total	4260 sq.ft.

Additional heating surface of the boiler is divided as follows: Slag screen, 2,330 sq.ft.; upper boiler tube bank, 14,260 sq.ft.; superheater, 5,380 sq.ft., and regenerative air heater, 40,400 sq.ft. Steam is generated at a pressure of 675 psi. gage with a total temperature of 750 deg. F. Feedwater temperature is 380 deg. Total furnace volume is 17,000 cu.ft., the width of each furnace 12 ft. 5½ in. in the clear.

If the center wall were eliminated, and assuming the same furnace widths were used, then the furnace height would increase about 15 ft. in order to obtain the same amount of cooling surface as in the split furnace design. Even if this had been done slagging difficulties, due to the nature of the fuel, would have developed. The accompanying heat distribution diagram (Fig. 3, Plate I), shows the absorption of heat in the various sections of the boiler. Heat liberated in the furnace and the temperature of the gases leaving the furnace at rates of 100,000 to 300,000 lb. per hour steam generated are shown in Fig. 3 (Plate II), while gas weights under various conditions of excess air are given in Fig. 3 (Plate III).

The boiler is fired with pulverized coal supplied by two B&W type E mills. Because of the high moisture content of the coal, air temperatures to the mill approximate 540 deg. in order to secure the greatest possible mill drying and reduction in mill power. Each mill supplies coal to two burners, one burner in each furnace section. Burners are of the Peabody make, equipped with auxiliary oil burners for lighting off and emergency operation. Two burners are provided per section.

In addition to the complication of high moisture and low fusion ash coal, the boiler burns pulverized refuse simultaneously consisting of oat hulls that have been digested by sulphuric acid in the manufacture of furfural, thereby further complicating the possibilities of slagging.

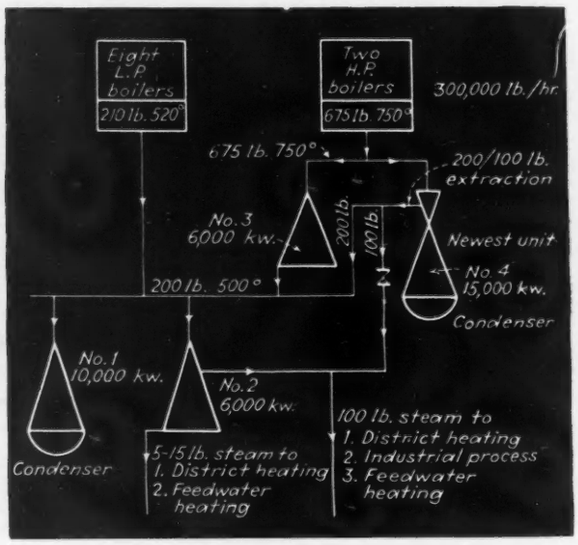


FIG. 5—Steam-flow diagram for Cedar Rapids plant extension

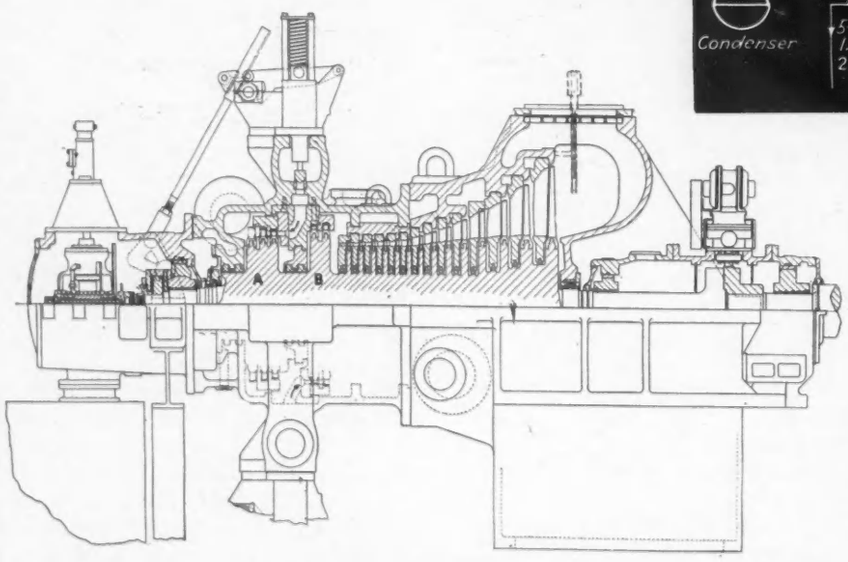


FIG. 4—Divided first stage of the Cedar Rapids turbine has two Curtiss elements (A) sealed off from the outer section (B) by shaft packing. Section A expands steam to extraction pressure, while Section B expands it down to the condensing section of the turbine

Turbine Detail

The turbine is a General Electric 15,000-kw., 0.7 power factor unit with steam end designed to pull the electrical end up to 18,750 kw., in an improved power factor range to approximately 83.3 percent. The generator is wound for 13,800 volts "Y" and is equipped with a conventional direct-connected exciter and pilot exciter.

WATER TREATMENT LOG _____ STATION _____ 19____

(1) DATE	MAKE-UP WATER				NO. 1 & 2 BOILER					NO. 3 & 4 BOILER					STEAM & COND. QUALITY, M OHMS						CHEMICALS USED, POUNDS							
	SOURCE	HARDNESS	TOTAL	ALK	TOTAL SOLIDS	TOTAL SOLIDS	PO_4	Na_2SO_3	BLOWDOWN	%	TOTAL SOLIDS	PO_4	Na_2SO_3	BLOWDOWN	%	Steam		Condensate										CHLORINE	
		GPG	M-GAL	PPM	PPM	PPM	PPM	PPM	M-LBS		PPM	PPM	PPM	M-LBS		1&2	3&4	1	4	6	Q.O.	COAG	LIME	ACID	SALT	SO_3	PO_4	M-U	COND
1																					(4)				(5)	(6)	(7)	(8)	(9)
2																													
3																													
30																													
31																													
Total or Average																													
(2)		6.3	100,968	38	175	972	8.6	175	24,711	6.1						190		120		150	190			18,992	298,500	7,081	5339	362	6,310
(3)		7.9	112,087	39	182	896	8.6	171	98,155	4.9	923	12.2	160	62,216	6.9	549	455	115	258	123	230			16,925	327,000	6,586	5290		6,661

FIG. 6—Water treatment log gives daily record of chemicals added to feedwater

(1) Daily record form for one month with totals at bottom.
(2) Total quantities for 1940. Condensate quality on undegassed samples.
(3) Total quantities for 1941. Condensate quality on degassed samples.
(4) Returned from industrial process.
(5) For regeneration of zeolite. (6) Sulphite. (7) Phosphate.
(8) Added to make-up water. (9) Added to condensate.

The turbine is unique in certain special features for supplying steam as a semi-topping unit to the old 210-psi., 500-deg. section of the station, extracting up to 180,000 lb. per hour, or by a change in the pressure control system 100 psi. process steam. To accomplish this the head end of the turbine is constructed in two sections and is as shown. Two Curtiss elements are provided and sealed off one from the other by suitable shaft packing. Section A expands the high-pressure steam down to the previous selected extraction pressure of either 200 psi. or 100 psi., dependent upon the adjustment of the control system, and Section B of the turbine expands steam down through the condensing section of the turbine. The turbine is provided with four points of steam extraction for feedwater heating, three points of extraction normally being used.

Condenser

The condenser was manufactured by the Allis-Chalmers Manufacturing Company and has the top entrance for the circulating water. It has a total surface of 18,000 sq.ft. Two circulating pumps are provided, each rated at 16,000 g.p.m. when one pump is used, and when two pumps are operating in parallel the rating per pump is then 12,000 g.p.m. One circulating pump is provided with a constant-speed motor and one pump is provided with a variable-speed motor. Two hotwell pumps are provided, one for emergency purposes. The extraction heaters used in connection with the feedwater cycle were furnished by Foster-Wheeler Corporation. Tube material is arsenical copper. The switchgear is of General Electric manufacture, metal-clad type and similar to that which was installed for the topping turbine installation made in 1938.

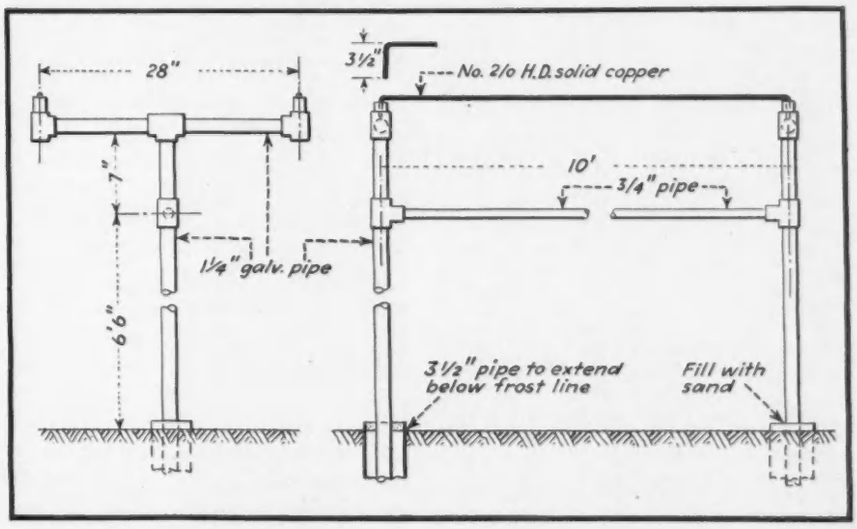
The new unit, boiler and turbine have been in regular commercial operation since October. The installation has demonstrated unusual flexibility, particularly in extraction and topping operations, and has been on the line and proved highly reliable, and the boiler has been singularly free from slagging difficulties.

• • •

Rack for Survey of Glaze Formation

By E. A. ZEHFUSS
Duquesne Light Company, Pittsburgh

In its state-wide study of the prevalence and severity of ice formation on wires the Pennsylvania Electric Association member companies have standardized a so-called sleet rack. Two 10-ft. lengths of No. 2/0 hard-drawn copper wire are supported horizontally on a galvanized pipe framework high enough to discourage its use by youngsters as a piece of gymnasium equipment. Two wires are provided so that the observer can have the second to weigh if he accidentally disturbs the deposit on the first when he weighs in. The 3½-in. right-angle ends have to be deducted from the measured weight to avoid error in expressing the weight per foot for the exposed horizontal portion.



GALVANIZED pipe frame supports two No. 2/0 HD copper wires used in exposed location for study of ice formation

Detroit Pioneers With 120-Kv. Pipe-Type Gas-Filled Cable—I

Detroit Edison selects modified Glover-type high-pressure, gas-filled, 120 kv. cable to provide 95,000 kva. of transmission capacity — Cable cores in steel pipe filled with nitrogen at 200 lb. psi. used in preference to separate reinforced lead sheaths under gas pressure

G. B. McCABE and F. M. HULL,† Detroit Edison Company*

WHEN it was proposed, more than two years ago, to install another 95,000 kva. of underground transmission capacity from a station on the Detroit Edison system considerable thought was given to the type of cable to be employed to carry this load. With the streets in the concerned territory already rather congested with conduit runs containing 24-kv., three-conductor, paper and lead transmission cables, the installation of another nine or ten 24-kv. cables to transmit this amount of power to various substations did not seem expedient. Besides, it appeared advisable to conduct this energy to a single transmission distributing point or load center about 7 miles away and there to tie in directly to the 120-kv. overhead ring system.

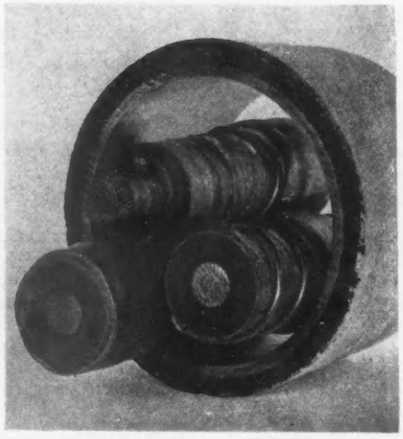
This article will discuss considerations involved in the final selection of a 120-kv. modified Glover-type, high-pressure, nitrogen-filled, pipe-type cable for the 35,130-ft. line and report operating experience to date. A subsequent article‡ will cover details and features in construction of trench and manholes, coating, preparation, laying, welding, drying and testing of pipe, installation of cable and evacuation and filling of line with nitrogen.

Available Cable Types

An investigation of the technical and economic advantages of various available cable types which might warrant consideration for this installation was undertaken. The following six types were studied:

(a) The company's standard 24-kv., 3-shielded, 350,000-cir.mil conductor, impregnated-paper and lead-covered cable (solid type).
(b) 120-kv. Callender gas-pressure cable.
(c) 120-kv. Pirelli oil-filled cable.
(d) 120-kv. Okonite-Callender Oilostatic cable.
(e) 120-kv. Hochstadter gas-pressure cable (compression).
(f) 120-kv. Glover (Beaver) gas-filled cable.

This investigation covered such characteristics as relative dielectric and impulse strengths, ionization and power factor, thermal properties, installation difficulties, cable movement, actual test and operating experience on the various systems, and comparative costs.



THREE 120-kv. cables in Somastic-covered steel pipe are under 200 lb. psi. nitrogen gas pressure

To depict cable construction lower left cable is shown as shipped with temporary lead sheath in place; lower right shows exposed copper skid wires and treated canvas tape after sheath removal; top center shows metal coated paper tapes both around conductor and over insulation, also stepped bronze, muslin and canvas tapes.

At the outset Detroit Edison standard 24-kv. transmission cable was eliminated when it was found that a 7-mile, 95,000-kva. installation of 24-kv. cable in the usual fibre and concrete duct banks would cost about double that of a 120-kv. Pirelli oil-filled cable installation, the type commonly used in this country.

The Callender gas-pressure type was excluded principally because of the absence of actual operating experience.

Pirelli oil-filled cable, of which several hundred miles have been put in commission in this country since 1927, has an excellent operating record, but its installation and operating costs are high and there are limitations in the length between manholes and size of cable.

A first-hand inspection was made of the Oilostatic cable installations and they were found to have given satisfactory service. A disadvantage of this type of installation is the large quantity of oil which must be handled and maintained in perfect condition.

While Hochstadter gas-pressure cable installations, all in Europe, have in general operated satisfactorily, there have been no installations of the so-called American type in which the encompassing steel armor wires have been omitted and the separate conductors thus allowed to "bird-cage" and snake in the pipe, thereby reducing longitudinal movement and working of the cable near the joints.

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‡ To appear in a later issue of "Electrical World."

The original gas-filled cable, as developed by C. J. Beaver of W. T. Glover & Company, Ltd., England, is insulated with paper tape, graded in thickness from the conductor out and pre-impregnated with a viscous compound. Tape is so applied, with gaps between turns, as to permit gas at 200 lb. psi. to permeate the whole insulation structure. A lead sheath, extruded onto the insulated core, is reinforced with wrappings of bronze tapes to withstand this high internal pressure. Principle upon which the gas-filled cable is based is that the ionization stress—*i.e.*, the volts per mil at which ionization of a gas space in insulating material starts—is dependent inversely upon the thickness of the gas space and directly upon the density of the gas. Employment of thin tapes of 2 to 2½-mil thickness in the high-stress region near the conductor and the use of nitrogen compressed to 200 lb. psi. fulfills this requirement and resulted in a cable that has given satisfactory service for almost five years at 132 kv.

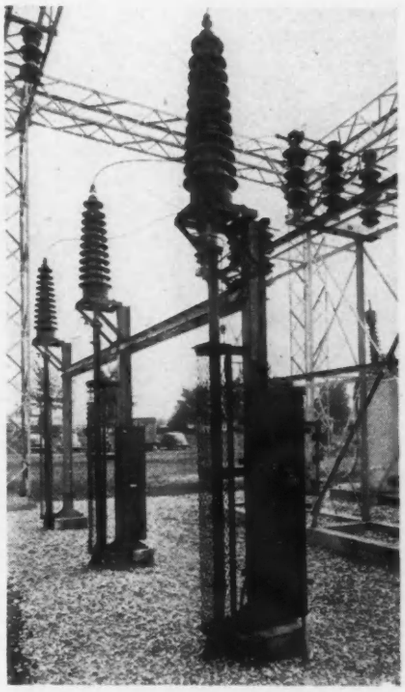
Glover Type SMD

For the Glover gas-filled cable S. M. Dean of the Detroit Edison Company conceived the happy idea of pulling the three insulated cable cores into a steel pipe and filling it with nitrogen at 200 lb. psi. instead of encasing them in separate reinforced lead sheaths as Beaver requires. This pipe type of gas-filled cable, called "SMD" cable, must like the Oilostatic cable, be constructed with a temporary lead sheath which serves as a protective covering during shipment and storage. During installation these temporary lead sheaths are removed and the unleaded cores pulled in the pipe as in the case of the Oilostatic cable.

Four of the above types of cable, viz., Pirelli oil-filled in conduit and Hochstadter gas-pressure, Oilostatic, and Glover gas-filled in pipe, merited consideration in connection with the proposed cable installation.

First-hand experience with successful oil-filled and Oilostatic installations in this country was readily available. To determine the relative merits of the Hochstadter gas-pressure (both European armored and American unarmored types) and the Glover pipe-type cables the Detroit Edison Company, in collaboration with the General Cable Corporation, decided to conduct a test simulating actual maximum operating conditions on a trial installation of these three types.

The experimental cable, consisting of (1) three 700-ft. consecutive lengths of Hochstadter three separately leaded 650,000-cir.mil conductor armored, (2) Hochstadter three separately leaded 650,000-cir.mil conductor unarmored and (3) Glover three single 600,000-cir.mil conductor unleaded cable, was pulled into



CABLE TERMINALS at top of copper riser pipes

2,100 ft. of 7-in. OD steel pipe buried 4 ft. below the surface of the ground. Insulation thickness of the Hochstadter cable was 500 mils and of the Glover 600 mils.

On March 29, 1941, it was connected in parallel with a portion of a working 120-kv., three-phase overhead line, to provide the necessary voltage and with a path for completing the circuit for the regulated load current. Loading, which was expected to produce a maximum conductor temperature of 70 C., was obtained by circulating current through the cable by means of insulating transformers.

The following observations and measurements were to be made during the experiment:

(a) Effect of handling, installation and loading on cable and lead sheath, as manifested by mechanical tests and photomicrographic studies of the lead sheaths and by examinations of styrenated samples from the cable before and after testing.

(b) Longitudinal cable movement by observations through sight glasses in pipe.

(c) Recorded temperature measurements at selected locations in each of the three pipe runs to indicate temperatures on cable, pipe, pipe covering, and at points in the earth vertically and horizontally from the pipe.

(d) Insulation resistance measurements of the four types of corrosion-preventive pipe coverings, including Somastic, the kind chosen for the commercial line, and detailed examinations of the pipes under the coverings at completion of test.

(e) Ionization tests covering power factor-voltage characteristics on the experimental line at selected temperatures during the test and on sample lengths of the SMD gas-filled cable at various gas pressures from zero to 200 lb. psi. in order to learn at what pressures ionization could no longer be prevented in the cable. It was found that at normal operating voltage of 69 kv., between conductor and ground, ionization was suppressed at a pressure just under 100 lb. psi.

(f) Deterioration as manifested by increase in solid loss to be determined by radial power factor measurements on individual tapes from samples of cable before and after testing.

(g) Impulse tests on samples of the cable before and after testing in order to determine the effect of such aging on the surge strength of the insulation.

Impulse Strength

Impulse strength of the gas-filled test cable, consisting of 120, 5-mil, normal-density, pre-impregnated paper tapes, was approximately 700 kv. In the cable chosen for the working line insulation was graded, the inner 18 layers being 2½-mil extra-hard calendered tapes, the next 22 layers being 3-mil hard calendered and the outer 98 layers being 5-mil normal calendered. The surge strength of this cable was in excess of 1,000 kv., the capacity of our surge generator.

Since expected system load demands required that the new cable operating in December, 1941, a decision had to be made in the spring of 1941 as to the type of cable installation to allow time for manufacture, shipment, installation, acceptance testing etc. Since experimenal tests did not start until late in March, little data were obtained to aid in the decision. The test set-up did, however, afford some valuable and subsequently useful experience in design, construction, installation and operation of pipe, cable, joints, potheads and nitrogen equipment.

Economic study revealed that installed cost was about the same for each of the pipe-type installations,

viz., the Hochstadter unarmored gas-pressure, the Oilostatic and the SMD Glover gas-filled in pipe, while that of oil-filled cable and auxiliaries in conduit was about 20 percent higher, sufficient to swing the choice to a pipe-type cable.

Since there was some question as to sheath life of Hochstadter cable due to fatigue from load cycle working, the effects of bloating should the gas enter such a sheath opening and displace some of the oil, and regarding the advisability of installing cable having sheath loss and bonding problems, and since inert nitrogen gas seemed to be a desirable and easily installed pipe-filling medium instead of the bulky and more readily contaminated oil of the Oilostatic cable, with its extensive auxiliary equipment, the choice finally lay with the SMD gas-filled cable.

Cable Specifications

The conductor is 600,000 cir.mil, normal stranding, with a wrapping of two metal-coated paper tapes to eliminate strand effects.

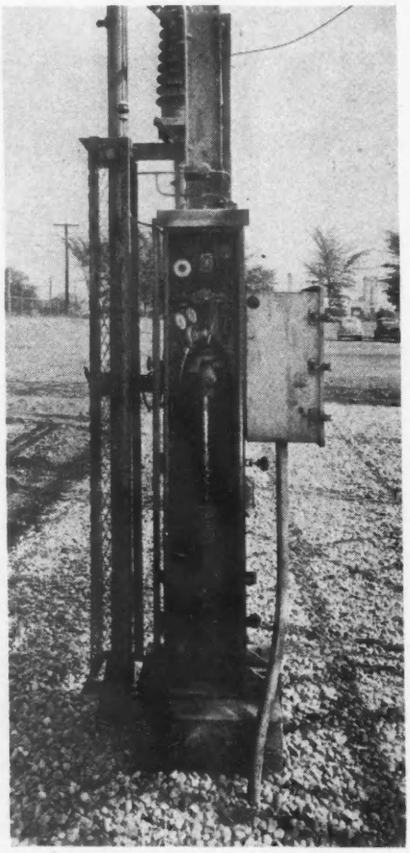
Insulation, 600 mils thick, consists of 138 layers of pre-impregnated paper tapes. Impregnating compound is quite viscous, having a Saybolt Universal viscosity of 76,000 and 3,000 seconds at 50 C. and 100 C., respectively. Three grades of paper, as described, were employed because it was felt wise to have an impulse strength of at least 750 kv., equivalent to that of porcelain bushings on the 120-kv. transformers and switchgear.

Paper insulation is covered with two intercalated layers of metal-coated paper for electrical shielding, and that in turn is held in place with a layer of thin bronze tape intercalated with a saturated muslin tape. Over this is a layer of paraffined canvas to give moisture protection during installation when the cable is exposed to air and moisture. Over the outside of the canvas tape is a wrapping of two 100 x 200-mil half-round copper wires, applied open spiral with 1-in. separation, to give mechanical protection in pulling and against creepage in operation.

The cable is shipped with a temporary 6/64-in. lead sheath, which is stripped off at the time of installation in the field.

A view of the approximate arrangement of the three cables in the Somastic-covered steel pipe is shown.

The line is 35,130 ft. long from terminal to terminal. Cable terminals at the top of copper riser pipes and the connections to the 120-kv. station bus are shown in an accompanying illustration. The line is broken into five nearly equal sections by gas-tight stop joints, to aid in locating leaks and prevent loss of too much gas in the event of a series leakage or by reason of repairs. Nitrogen pressure is maintained in the pipe by two 200-cu.ft. nitrogen tanks (shown) through automatic regulating valves at each end of the line. The pipe is 7-in. OD,



NITROGEN PRESSURE of 200 lb. psi. is maintained in pipe by two 200-cu.ft. nitrogen tanks through automatic regulating valves at each end of line

¼-in. wall thickness, electric welded steel. Individual cable lengths run about 1,200 to 1,300 ft., the maximum being almost 1,500 ft.

There are thirty manholes, including six stop-joint manholes. The by-pass, consisting of a 2-in. pipe and a high-pressure manually operated valve at each stop joint, will be operated normally open; *i.e.*, the entire pipe line will be one continuous gas chamber. Therefore, there has been installed no signaling system except contact-making pressure gages at the two ends, set to sound a warning at a minimum pressure of 150 lb. Since, as mentioned, the cable operates without ionization at a pressure just under 100 lb., the line would be shut down should the pressure drop to 100 lb.; however, a warning is wanted at 150 pounds.

Operating Engineer

Aside from a few readily repaired minor gas leaks in the pipe system and in defective bakelite stop-tubes at four of the six potheads, the line has operated satisfactorily since being placed in service on December 31, 1941. A steel ball-bearing type of safety valve, installed in the caps of the outer shells or bushings of the potheads, has proved a valuable accessory as it functioned to reveal the leaks without damage to or disruption of the bushings.

Since being put in commission the line has been carrying a load averaging about 65,000 kva. over the 24-hour period, including week-ends, the weekday and evening load being quite steady at about 80,000 kva.

Of principal concern is the normal continuous rating of this cable. It is estimated that the copper temperature will reach 70 C. at 100,000 kva. As yet, it is not known what its shorter overload rating might be.

The Somastic covering has an appearance and structure similar to asphalt paving surfacing. It consists of a primer coat over which is a hot-extruded ½-in. layer of asphalt mastic mixture.

The protective covering now has an average resistance to ground of 500,000 ohms per lineal foot. Each end of the pipe is normally tied to the system ground through bolted connections, which may be removed for test purposes.

Measuring stations are provided at every manhole, where checks may be made of the potential drop over 50 ft. of pipe and of the voltage to earth and to other structures. While these stations were intended to serve principally as a ready means of checking for stray currents, it is hoped to employ them also in a method which is being developed for detecting local corroded areas on the pipe, should they occur.

For cable-fault method see page 78, this issue.

BLACKOUT GUIDE

Official specifications are now complete to govern the blacking out of all types of buildings, both interior and exterior, and of street lighting during such periods and in such areas as this action is ordered by military authority. The specifications have been developed by the Engineer Board, research agency for the Corps of Engineers, U. S. Army, in consultation with other technical groups, and their terms apply equally to military and civilian defense authorities where actual air raid alerts are sounded.

Production of some items of specified blackout lighting equipment may not be adequate at this time for all who need it, but negotiations are in progress among the proper authorities in Washington to obtain an allocation of raw materials for the job. Any allocations that are made, however, are certain to be in minimum amounts for absolutely essential uses. Therefore, it is emphasized that no purchases of lighting equipment should be made until approved equipment can be secured and no purchases at all should be made of such equipment for use outside the zones in which passive protective measures are to be taken. At present, under terms of the revised WPB order L-28, an A-2 or higher rating is required to obtain incandescent blackout lamps and manufacturers are limited to approved types. Similar restrictions covering fixtures may be expected.

Utilities in coastal areas generally considered within enemy air striking distance can determine for themselves and their customers whether they are in such areas by checking with local OCD authorities, who, in turn, will receive instructions on this subject from the commanding generals in charge of the affected areas.

In the regions designated for passive protective measures the blackout specifications and any dimout regulations issued by the Army command take precedence over all others, including previously required anti-sabotage floodlighting, etc. Anti-sabotage protective lighting, however, remains in operation outside the designated military areas.

All approved blackout lighting equipment will carry the words: INTERIOR BLACKOUT—WAR DEPT. STANDARD, for use inside of buildings, or STREET BLACKOUT— WAR DEPT. STANDARD, for any exterior use. Manufacturers must submit their designs to an approved testing laboratory for advance test and report to the War Department before approval of the use of the markings on individual products will be given. At present, the Electrical Testing Laboratories, Inc., is the only accredited testing laboratory for this purpose. This approval applies only to lighting fixtures, lamps and wiring; there will be no labeling of approved materials for blackout by obscuration.

Interior Lighting

Interior blackout of buildings may be achieved in any one of three ways or combination of them: Extinguishment, obscuration or reduction of illumination to specified maximum intensities through use of approved equipment.

Extinguishment of lights is termed by the War Department as "not generally desirable." The specification states that "widespread application of this method causes serious disruption of normal military, industrial, commercial and home activities with attendant confusion, accidents, and possibly lowered morale—the very objectives sought by enemy air raids." This procedure is required only where advance preparation has not been made for either of the other two methods.

Obscuration is the recommended procedure for the more essential sections of industrial plants and other structures in which war activities are carried on. In residences at least one room should be tailored for obscuration. The specification points out that the depressing effect of black materials may be overcome to a large extent by selecting materials which are light colored on their inside surfaces or by a coat of light paint over the required drab or black.

This method requires that necessary advance preparations be completed to insure that windows, exterior doors and other openings through which light might escape are made completely light-tight within *two minutes* after the official blackout signal is given. Obscuration may be accomplished by use of paint, adhesive coverings, screens and shutters, light locks, "or any other means which will permit normal interior illumination without exposing any light on the outside."

Wherever possible it is a good idea to apply obscuration materials to the outside surface to minimize reflection from glass, etc. This is required in the case of skylights and other glass areas that are not vertical.

Paint

Paint used for obscuration must be weatherproof, lusterless (mat or low gloss) and drab or black in color; it should be easily removable and require only one coat for complete opacity. Careful application is necessary to avoid "missed spots." Paint is stated to have several disadvantages —when the glass is shattered light is exposed, artificial illumination is required in daytime, heat absorption by the paint may affect work inside the building or shatter the glass.

Prior cleaning, especially to remove all grease, is required when adhesive coverings are used. Materials must be opaque, adhere strongly to the glass and should possess considerable tensile strength or elasticity to absorb some shock. Cloth, paper or fibrous materials are permitted. Such coverings have the same disadvantages for obscuration purposes as paint.

Opaque shades, drapes, blankets, builder's paper and similar materials all are permitted for light obscurement by screening. These must be placed with an overlap of 6 to 8 inches on all sides. When rigid screens or shutters are used they must either fit neatly in channels designed for the purpose or sufficiently overlap the opening to prevent light leakage; it is desirable that the screens be held in place by flexible or elastic means to absorb some blast shock. "Any type opaque covering material which meets the above conditions will be satisfactory," the specification states.

Light Locks

Entrances, exits and ventilation openings all must be fitted with light locks. These consist essentially of passageways (or vents) with dull black surfaces, with inner and outer openings offset, and so constructed that no light, direct or reflected, is visible from the outside. Light sources near the interior openings of light locks must be shielded so that no direct light enters the lock.

Reduced illumination, the third method of achieving blackout of interior lighting, may be accomplished either by use of a special blackout lighting fixture or approved type incandescent lamp.

Fixtures

The blackout fixture must have a minimum of 1½ and a maximum of 3 initial lumens to a light-adapted eye. Initial candlepower at any angle, again to a light-adapted eye, may not exceed 1. Most of the light must be in one hemisphere; not more than 0.15 lumen is permitted in the second hemisphere. The light must be either orange or orange-red—blue has been abandoned entirely — and the unit must be of "rugged construction and not subject to derangement, tampering or misuse."

Lamps

Blackout incandescent lamps may not exceed 15 watts and must have a medium screw base and an A-15 type bulb. Voltages are limited to 120 volts (lamp to be marked 115-125 volts) for general lighting service, 240 (marked 230-250 volts) for high voltage service, and 32 volts (marked 30-34 volts) for country home and transportation service. The bulb must have an average laboratory life of 1,000 hours or more at rated voltage. It must be opaque coated except for an orange or orange-red circular aperture not exceeding one inch in diameter on the bulb end. Only black is permitted for the opaque coating material and this must be resistant to scratching or removal—pinholes are permitted, however, so long as not more than 0.15 lumen of light escapes into the second hemisphere.

Unit Mounting

Indoor blackout units, including incandescent lamps, as described above may be used only in accordance with these directions:

1. In small or medium-size rooms (not over 200 sq.ft. of floor area) — one unit per room.
2. In larger rooms and in corridors—not more than one unit per 100 sq.ft. of floor area.
3. Units must always be at least 10 ft. apart and 3 ft. from any window, exterior door or other opening. They may not be pointed toward any such opening.
4. When openings are covered with drawn window shades, drapes, blinds, or even one thickness of newspaper, units may be installed at any height. When exterior openings are not covered, blackout units shall be located above the top of such openings.

Luminescent materials are permitted for indoor blackout under certain restrictions, but the specification indicates that their use is limited. Phosphorescent materials are permitted for outlining doors, knobs, switches, stairs, elevators, railings, corridors, paths to shelters, first aid stations, rest rooms, etc., but it is stated that controlled laboratory applications of this material usually give better results than at the point of use.

Fluorescent Materials

In most instances, the specification states, indoor blackout units or lamps "will provide reduced illumination more efficiently than will a combination of ultraviolet radiation and fluorescent materials." When fluorescent material is used, however, at locations where the glow is visible outside the building, the surface brightness of the materials shall not exceed 0.001 foot-lambert and the ultraviolet source shall be completely invisible from the outside. High cost of radioactive markers and tape is considered to limit their usefulness, although they are available where a continuous brightness higher than phosphorescent is desirable. Only tape or markers approved by the War Department may be used at all and these must be handled as directed.

Exterior Lighting

The War Department specification for exterior blackout lighting requires an electrical system separately operated from the normal lighting system, whether it be street lights or illumination of docks, loading platforms, plant yards and grounds, open sheds, etc. It is not proposed, however, that extensive blackout lighting installations be made until there is reason to expect frequent or prolonged periods of blackout.

Exterior blackout lighting, even then, is intended to be installed only where complete elimination of all artificial lighting is not desirable. Total light extinguishment is "the most effective possible blackout," but it is recognized that this would seriously handicap the activities of military and civilian defense personnel "at the very time when it is of vital importance that they be able to move about and perform their services efficiently."

In general, according to the specification, blackout lighting will be considered necessary "where substantial pedestrian movement is expected during blackouts — business and office districts, shopping centers, roads and walks leading to war plants, important crosswalks on heavily traveled thoroughfares, etc."

Intent of the specification is to provide "the greatest possible illumination for ground activities commensurate with reasonable protection

from aerial observation." In terms of illumination this is defined as being an average of approximately 0.0003 foot-candle on a horizontal surface at street level; at no point may it exceed 0.0006 foot-candle. This is about double the light provided by starlight on a clear, moonless night.

Exterior blackout light must be "white" as produced by a tungsten-filament lamp operating at approximately its rated voltage. Blue light has been abandoned entirely by the Army as a blackout light because: "(1) It is most easily detected from the air by dark-adapted aerial observers; (2) it provides hazy and indistinct visibility for ground activities, and (3) it becomes useful on the ground only after a relatively long period of dark adaptation of vision."

Normal Lighting

Except during blackout periods, it is intended that normal lighting shall prevail. The specifications unequivocally oppose the use of "dim-out" methods as a means of reducing danger of aerial spotting, stating:

"Any curtailment of present street illumination at other times is not recommended. Reduction in voltage, lamp size, or number of street lamps results in added traffic hazard without any significant decrease in ease of detection and identification from the air."

(In coastal areas, of course, dim-out measures may be ordered by the military for eliminating sky-glow which silhouettes shipping for submarine attack. This is a separate wartime lighting problem and a covering specification is being developed.)

Subject to later directions from the military commanders having charge of specific areas, the specification proposes that at this time the only steps to be taken are arrangements for extinguishing all normal lighting within *two minutes* after an official blackout signal, and development of blueprint plans for blackout installations to be available for immediate use if necessary.

Location

Officials responsible for street lighting in those areas designated by military authority as requiring passive protective steps should first determine the locations where blackout units would be required in the event raids or threatened raids became frequent. Commercial and industrial concerns with lighting problems independent of municipal street lighting should initiate the same program. Both should act in consultation with military authorities.

Once potential blackout lighting locations are determined, surveys should be made of the equipment required and the amount on hand which can be used; in this connection, the specification points out that iron wire is adequate for the purpose. Detailed plans should be drawn up showing placing and mounting of each blackout unit—then filed until they are needed.

Blackout Circuits

Specifically designed blackout lighting luminaires (marked: STREET BLACKOUT—WAR DEPT. STANDARD) and War Department-approved incandescent blackout lamps (marked: FOR USE IN BLACKOUT LUMINAIRES) will both be required wherever exterior blackout installations are made. It is recommended that blackout circuits be connected in multiple to secondary distribution lines, without switching provision, and burned continuously—the method considered "likely to result in lowest over-all cost, besides conserving labor and materials and insuring that the blackout lighting will be on whenever needed." Permissible, however, is installation of switching equipment and assignment of personnel to turn on the blackout circuits within the *two-minute* period after an alert in which normal lighting is being extinguished.

Blackout luminaires shall be so constructed that, when equipped with blackout lamps, the candlepower distribution curve of the luminaire is, in all vertical planes, wholly inside the limiting curve "A" in Figs. 1, 2 or 3 (next page), at the appropriate mounting height. The distribution curve in any vertical plane making an angle of less than 45 deg. with the vertical plane parallel to the street axis shall lie outside the corresponding limiting curve "B" in the same figures. Construction of the limiting curves in these figures are based on the values in the following tables, respectively:

Table 1—Candlepower for Nominal 10-Ft. Mounting Height (Fig. 1).

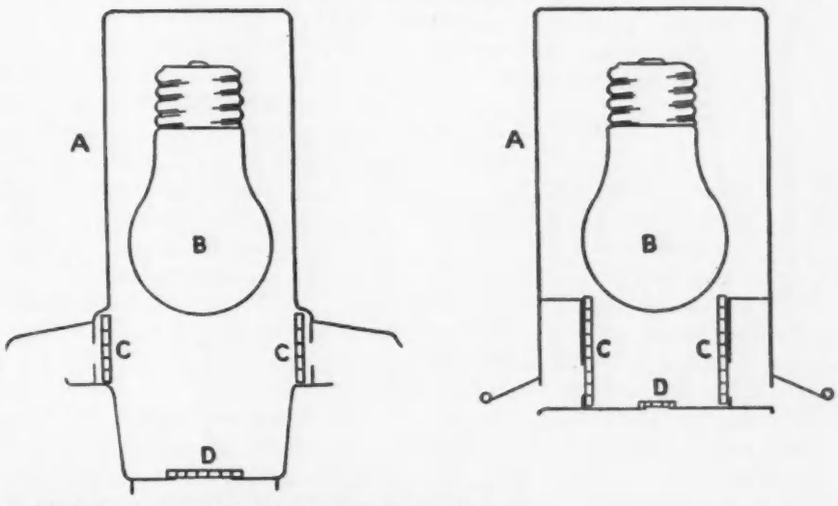
Angle	Curve A	Curve B
0°	0.06	0.03
60°	0.45	0.13
65°	0.90	0.22
70°	0.90	0.45
80°	0.90	0.45
85°	0.45	0.00
90°	0.00	0.00

Table 2—Candlepower for Nominal 15-Ft. Mounting Height (Fig. 2).

Angle	Curve A	Curve B
0°	0.14	0.07
45°	0.40	0.15
70°	1.35	0.70
80°	1.35	0.70
85°	0.75	0.00
90°	0.00	0.00

Table 3—Candlepower for Nominal 20-Ft. Mounting Height (Fig. 3).

Angle	Curve A	Curve B
0°	0.25	0.10
60°	0.60	0.35
70°	1.50	0.75
73°	2.25	0.75
80°	2.25	0.75
85°	1.15	0.00
90°	0.00	0.00



EXAMPLES of acceptable blackout luminaire design

Based upon two of the more widely used British designs. Maximum over-all dimension of 8 to 10 in. Lamp housing (A) painted white inside and dull black outside. Lamp (B) position may be varied within reasonable tolerances without altering appreciably light distribution or output. Cylinder (C) or plate (D) may be of opal glass or perforated metal. Note minimum of exposed glass.

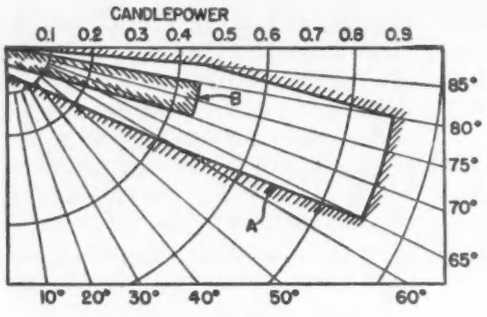


Fig. 1—Mounting height 9 to 14 ft.

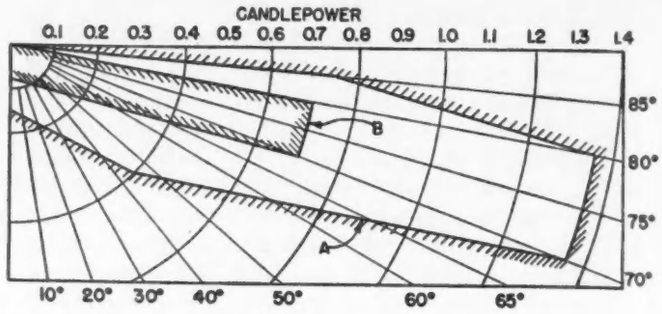


Fig. 2—Mounting height 15 to 19 ft.

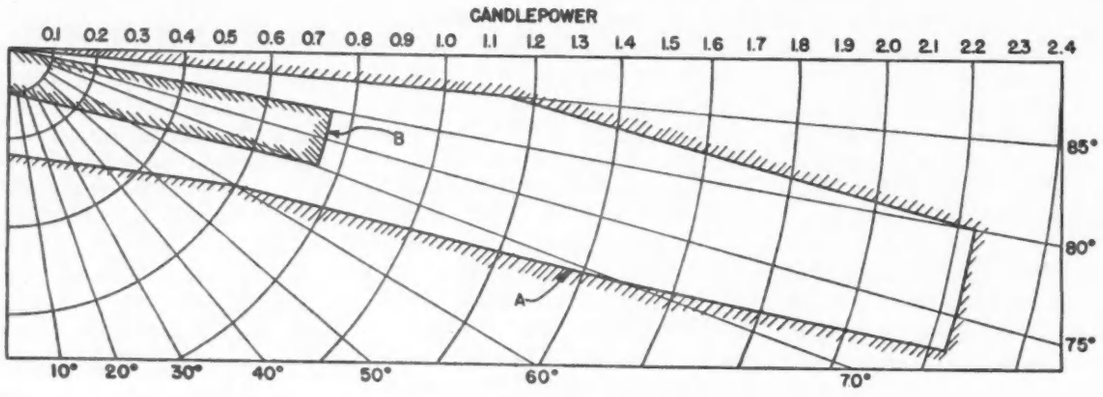


Fig. 3—Mounting height 20 ft. and upward

LIMITS OF polar curves of candle-power distribution for blackout street lighting luminaires at the mounting heights indicated

All photometric tests to determine compliance with this specification must be conducted in a nationally recognized testing laboratory and not by street performance, because of the difficulties and inaccuracies inevitable in outside measurements of such low values. Equipment used must be capable of measuring 0.03 to 2.25 candle and tests must be made with a receiving surface not less than 2 ft. from the light source with the lamp operated at or near rated lumen output. A detailed appendix is attached to the specification to outline instructions for conducting these tests.

Mounting Heights

Luminaires are to be mounted at heights dictated by the light distribution values. Manufacturers will mark their products for 10, 15 or 20-ft. mounting height and the permissible range is that shown in the three light distribution curves. Units must be more than 100 ft. apart, measured along a line joining them in plan and preferably at least 150 ft. apart. Single units may be used at isolated locations.

It is expected that, except in unusual instances, existing wood or metal poles will be used, with those selected which afford reasonably uniform spacing yet maximum permissible illumination at crosswalks, intersections and similar points of hazard. Units must be mounted rigidly and properly oriented if they provide an asymmetric distribution of light. When close to light-colored surfaces or expanses of water, dull black screens are required to prevent direct light from falling on these surfaces.

Equipment

Blackout luminaires are to be constructed as small as practicable, preferably with an over-all dimension of not more than 8 to 10 inches—two British models of acceptable design are illustrated on the previous page. The units are to be ruggedly built and not subject to deterioration such as would bring the photometric performance outside the specification limits. Manufacturers must obtain advance design approval and obtain a serial number to be stamped on each product.

The incandescent lamps employed in these luminaires shall be 10-watt inside frosted lamps which have been especially designed for the long life and resistance to shock required in this use. Where an approved blackout lamp is not available, a 10-watt inside frosted general service lamp may be used as a temporary expedient. But there is no lamp which is permitted for exterior blackout lighting except in approved blackout luminaires, and no lamp other than 10 watts for use inside the fixtures.

Inspection

These outside blackout units should be inspected at least once a week to insure that they are in proper operating condition. Cleaning of luminaires is recommended at least twice a year, oftener in smoky areas. Where blackout lighting burns continuously, periodic replacement of lamps is recommended every four months. Where the units are switched on only for tests and during blackouts, replacement nearly as often will be found necessary because low-wattage filaments are less able to withstand vibration and shock when cold than when burning and after four to eight months their mechanical strength is likely to be seriously impaired.

Exterior blackout restrictions do not limit the use of phosphorescent or radioactive materials. Fluorescent materials are also permitted, but only to a surface brightness of 0.001 foot-lambert with the ultraviolet source invisible.

Lighting Bottlenecks

Inspection of one thousand plants shows frequency of lighting conditions that handicap war workers, particularly in small shops — Recommended corrections given

H. H. GREEN, Lamp Department, General Electric Company

SINCE January of this year we have had a group of men located in New York State who have been serving as lighting counselors to plants engaged in war production. It has been their function to call on little five-man shops as well as larger plants that were either already engaged in war production or seemed likely to do war work later. Their job was:

1. To seek out lighting bottlenecks which created seeing conditions that were a real handicap to war workers.

2. To submit recommendations which would remove the lighting bottlenecks based on making the best possible use of existing equipment and a minimum of new equipment. Where new equipment was required and desired, the counselors assisted in securing it through established channels of distribution.

By the middle of June close to one thousand shops and factories had been called on and worked with in Albany, Binghamton, Elmira, Rochester, Schenectady and Troy. A written report was submitted on each call. These reports reveal the following:

1. Practically no plant exists, that has not been built or remodeled for war production, in which there are no lighting bottlenecks.

2. These lighting bottlenecks will become much more painfully apparent to war workers as night shifts become more prevalent.

3. The big plants which employ men with a knowledge of lighting have received a superabundance of attention from the industry. The small plants have been passed by. Most of the 10,000,000 more workers which will be added to war production this year will go to work in these plants in which the lighting was designed for daytime operation and peacetime jobs.

4. No list that we have seen reveals all the places where important war work is done today. For example, one of the counselors reports three shifts of five men each working on a $250,000 job for the Army in a two-car garage behind a humble private home.

5. Of all the plants with war orders 43 percent have not only welcomed the counselors' services, but acted on their recommendations.

Here are the lighting bottlenecks which the counselors most frequently encountered and the percentage of plants in which each was handicapping workers:

Dirty Lighting Equipment—68%

More than two-thirds of the plants inspected were losing lots of light from dirt and most of them decided to do something about it when the loss was demonstrated to them.

Direct Glare—64%

This is the most prevalent evil in present-day existing lighting equipment. Here are the ways direct glare was removed and the percentages of plants in which each method was applied: (*)

Shading bulbs	48%
Silvered bowl bulbs	28%
New fixtures	20%
Change position of light	12%

Too Little Light—58%

No matter how we utilize existing equipment, the lighting in more than half of the pre-war plants is just not enough by any standard for more critical work and the night work which is being required today. Here are the two ways that condition was overcome:

New lighting fixtures	86%
Correct size lamp bulbs	32%

Shadows—52%

In more than half of the plants you find that either workers are standing in their own light or some other source of shadow makes the work hard to see. The correction was:

Change position of light	62%
Change position of work	23%
New fixtures	31%

*These percentages and others that follow total more than 100 percent because more than one method of smashing a bottleneck was used in many cases.

Reflected Glare—35%

Glare reflected from work is at least half as prevalent as, and often more annoying than, direct glare and exists in over a third of the plants. Correction.

Change position of light	61%
New fixtures	39%
Silvered bowl bulbs	36%

Dark Wall Contrasts—33%

Because it takes time and energy for workers to adjust themselves to sharp contrasts, dark walls are a handicap to efficient work, besides absorbing a large percentage of useful light. This condition can be remedied with paint or higher levels of general illumination. Correction:

Paint	89%
New fixtures	11%

Point Light Source Reflections—28%

Where people are working on curved surfaces, this blinding condition frequently exists and is only alleviated by increasing the size of the light source. Correction:

New fixtures	64%
Silvered bowl lamps	36%

Inspection—20%

In spite of the importance of inspection, the counselors found lighting was a distinct handicap at the inspection benches in one out of five shops. Correction:

New fixtures	50%
Shades	34%
Change position of light	16%

Specular Reflection—19%

The reflection of the light source from shiny work surfaces reduces the ability to see details and work accurately. Correction:

Change position of light source	80%
New fixtures	20%

Daylight Glare—18%

In one out of six plants a worker with plenty of daylight is handicapped by glare just as much as those looking into bare bulbs. Correction:

Moving position of worker	60%
Shading or painting skylight or window	40%

Line of Vision Glare—18%

Although the light over a certain machine may be all right for the worker at that machine, he may still be partially blinded by a row of lights in his line of vision. Correction:

Proper shading	40%
Silvered bowl lamps	40%
New fixtures	20%

Some of the other lighting bottlenecks uncovered and the percentages of shops or plants in which they were found are:

Vibration	12%
Poor color discrimination	9%
Desk top contrast	8%
Bad light for setting and adjusting	7%
Line light shadows	6%

There has been nothing remarkable about the work of this little group of counselors, but from their work it has been possible to gather facts and produce the materials to help many others. During June more than 1,000 utility men in 30 cities were trained in this work of removing lighting bottlenecks from war production.

Transformer Operating Guide to Feasible War Loadings

Direct determination of transformer capability in light of ambient temperature, thermal capacity, load factors and favorable design — Based on operating experience and ASA C-57

H. W. HARTZELL, Commonwealth & Southern Corporation, Jackson, Mich.

FOR a number of years operating utilities have recognized that in many applications the effective capability of a transformer may be considerably more than its nameplate rating due to the nature of the load, favorable ambient temperature conditions and the thermal characteristics of the transformer. Likewise, short-time emergency capabilities considerably in excess of normal capabilities may be assigned, without resulting in a condition of imminent failure.

The war situation has focused attention on necessity for the very maximum loading of all types of apparatus so that existing equipment may be utilized to a greater degree than ever before, even to a value just short of the point of accelerating life consumption. This article summarizes the results of an intensive study of the thermal loading of transformers and is presented to utility operators and industrial users as well in the interest of conservation of critical materials, so that full advantage may be taken of the factors involved and favorable operating conditions in determining normal and short-time emergency capabilities with assurance of reasonable life expectancy.

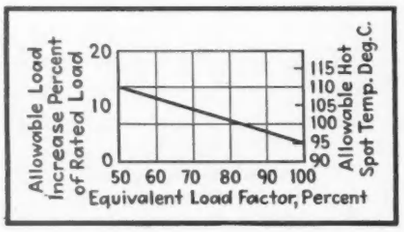


FIG. 1—Transformer hot-spot temperatures and allowable load increase as determined by equivalent load factor

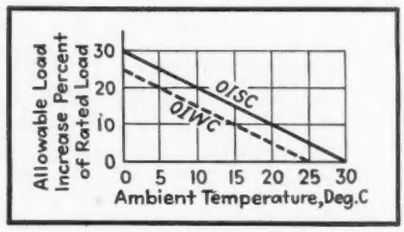


FIG. 3—Allowable load increase as determined by ambient temperature

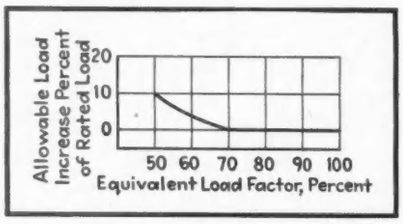


FIG. 2—Additional load realized by taking advantage of thermal lag of the transformer; derived from temperature calculations on typical OISC transformers

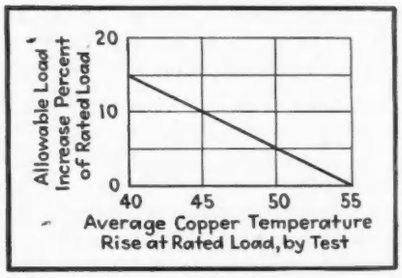


FIG. 4—Allowable load increase as determined by copper test temperature

Limitations

It is expected that by assigning operating capability ratings to transformers many units may continue in operation at their present locations, even though the load may at times exceed the nameplate rating. This greater use of present equipment will result in conservation of critical materials and in appreciable savings in the various investment and operating costs associated with such installations.

It should be stated at the outset that limited abilities of associated circuit equipment and transformer accessories themselves may not make it feasible to obtain the full normal or emergency capability of the transformer. A careful check should be made of thermal abilities of all associated switches, current transformers, connections and relays, as well as the restrictions placed by meter scales, relay settings and oil expansion before the transformer capability is reached.

The maximum load capability may also be limited by the ampere limitations at the reduced output voltage occurring at heavy overloads. Where increasing the load on the transformer may result in excessive voltage regulation, it may be found in some cases that less critical materials will be required and that the most economical over-all design will be attained by increasing the transformer bank size rather than by providing additional transmission and distribution facilities as might be required.

The hot-spot temperature limits in the Operating Guide in ASA Standard C-57-Transformers may serve as a basis for determining the loads that transformers may safely carry. These

temperature limits for recurrent loads are:

Duration of Load	Maximum Allowable Hot-Spot Temperature
2 hrs	110 C
8 hrs	105 C
24 hrs	95 C

Actual load cycles experienced on various transformers are difficult to classify into groups for convenient study of effect on transformer heating. However, simple equivalent load cycles may be set up in two blocks of load, one having a value equal to the peak load and the other a value equal to the minimum load of the cycles, which will have an equivalent load factor equal to the actual load factor of the transformer load. This block type load would result in higher transformer temperature than would appear for the actual load cycle. An extensive study of typical loads showed that many transformer load cycles have minimum values from 40 to 50 percent of the peak load value. Therefore, block type daily loads with the minimum load block having values between 40 and 50 percent of the maximum have been used for determining effect of load factor on allowable transformer loads.

It may be shown that on the above basis a 50 percent equivalent load factor corresponds with a two-hour maximum load, a 65 percent equivalent load factor corresponds to an eight-hour load, and obviously a 100 percent load factor corresponds to a 24-hour load.

Equivalent Load Factor

Therefore, "Equivalent Load Factor" could be substituted for "Duration of Load" in the above table, with the result that for load factors of less than 100 percent the equivalent allowable hot-spot temperatures could be greater than 95 C. on the recurrent load cycle. Fig. 1 shows this relation between equivalent load factor and allowable hot-spot temperature.

In those cases where the actual load cycle is such that the minimum load is less than 40 percent of the maximum load, it is necessary to calculate the equivalent load factor rather than the actual load factor. In calculating the equivalent load factor all minimum loads must be assumed to be not less than 40 percent of the daily maximum. If minimum loads are 40 percent or more of maximum daily load, the actual and equivalent load factors are identical.

Temperature calculations show that for most typical transformers approximately 1 percent of nameplate rating increase in load will increase the transformer hot-spot temperature about 1 C., constant ambient temperature being considered. It is therefore deducted from the curve of Fig. 1 that 0.3 percent of nominal rated load can be added to the nominal rating for each 1 percent that the equivalent load factor falls below 100 percent and that the hot-spot temperature of the transformer will not exceed those shown in Fig. 1. This presumes that the maximum load will be applied for a time sufficient to attain the full hot-spot temperature rise.

For load factors of less than 70 percent the maximum load is not applied in the "block" type of load cycle for a time sufficient to attain the allowable temperature due to the thermal lag of the transformer. Additional load, as a percentage of nominal rated load, may be applied (Fig. 2) to a transformer operating at less than 70 percent equivalent load factor by taking advantage of thermal lag during the normal daily operating cycle.

Ambient Temperature

Ambient temperature, too, helps to determine the load that a transformer may carry without exceeding the hot-spot temperature limits. The "Operating Guide for Transformers" in ASA Standard C-57 allows 1 percent of rating increase in load for each degree C. that the average daily ambient falls below 30 C. for self-cooled transformers and below 25 C. for water-cooled transformers. The rating should be similarly decreased 2 percent for each degree above normal ambient temperature. Additional load may be carried (Fig. 3) during low ambient temperatures on this basis.

Some judgment is required in selecting representative ambient temperatures that may be expected for the season of the year when critical loads may occur. One method is to use the average mean monthly temperature plus 8 C. as the ambient temperature when entering the chart of Fig. 1. Other methods may be derived from studies of daily temperature variations for various locations.

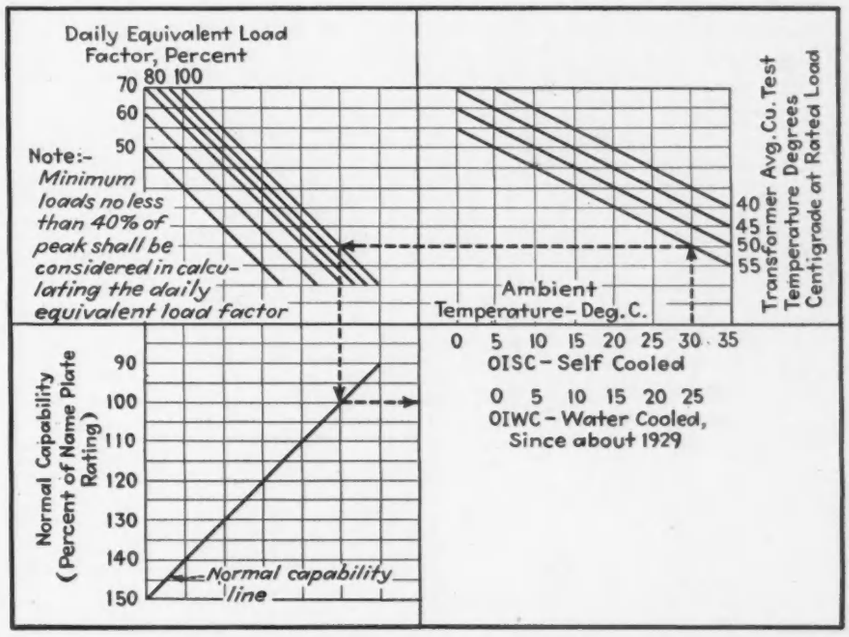


FIG. 5—Transformer normal capability chart: assuming voltage, transformer accessories and associated circuit apparatus have been found adequate; for modern self-cooled and water-cooled transformers

Low Average Copper Temperature

Some transformers, due to design, have inherently low average copper winding temperature rise over ambient. Since the ASA Standard C-57 limits the temperature difference between hot-spot and average copper to 10 C. at rated continuous load and standard ambient, some additional load may be carried by transformers having generous designs without ex-

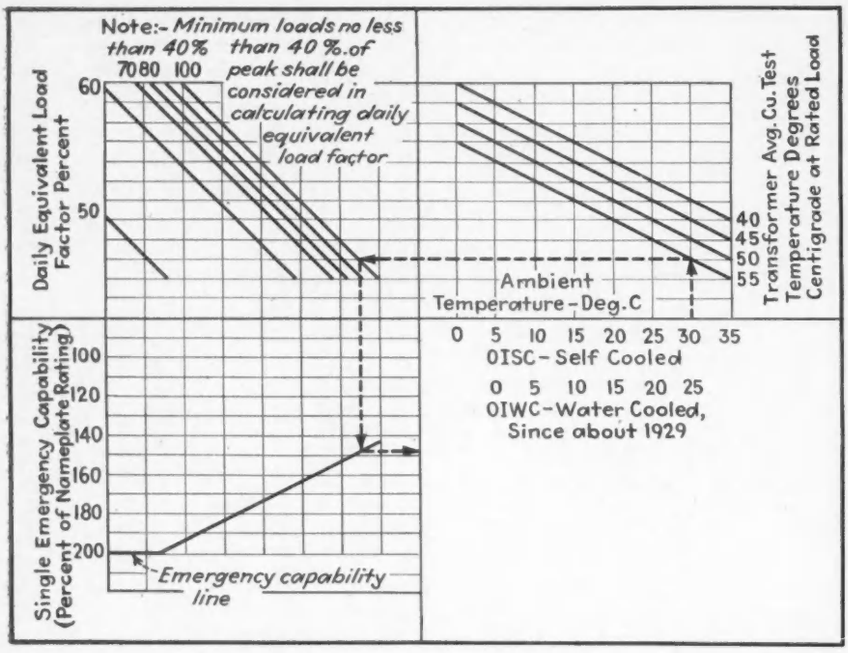

Note:- Minimum loads no less than 40% 70 80 100 than 40 % of peak shall be considered in calculating daily equivalent load factor
Daily Equivalent Load Factor Percent
60
50
Ambient Temperature - Deg. C
0 5 10 15 20 25 30 35
OISC - Self Cooled
0 5 10 15 20 25
OIWC - Water Cooled, Since about 1929
40
45
50
55
Transformer Avg. Cu. Test Temperature Degrees Centigrade at Rated Load
Single Emergency Capability (Percent of Nameplate Rating)
100
120
140
160
180
200
Emergency capability line

FIG. 6—Transformer single emergency capability chart; may involve some sacrifice of life and assumes voltage, transformer accessories and associated circuit apparatus have been found adequate.

ceeding the allowable hot-spot temperature rise. The additional loads that low copper temperatures allow are considered to be determined in much the same manner as those allowed by low ambient temperatures in that 1 percent of rated load may be added for each degree C. that the test average copper temperature rise is below 55 C. Additional load governed by this factor may be applied (Fig. 4).

Normal Capability

It has been shown above that certain load conditions and transformer characteristics may permit operation at loads in excess of nameplate rating without exceeding recognized permissible hot-spot temperatures. Maximum load that may be allowed during the recurrent daily load cycle—*i.e.*, normal capability of a transformer—is thus determined by the nature of the load cycle, ambient temperature, transformer thermal characteristics and method of cooling.

The capability of a transformer can be found for any normal-load condition by using Figs. 1, 2, 3 and 4. These relations have been used to develop the composite application chart (Fig. 5), which provides a convenient method for taking into account the various factors involved. To determine the normal capability of a modern self-cooled or water-cooled transformer, the chart is entered at the probable maximum ambient temperature determined by the location and season. Trace upward to the average copper winding (preferably as determined by heat run test) temperature, left to the transformer load factor, down to the normal load line, and to the right where the normal capability may be read.

Emergency Capability

There is also an emergency capability which should be recognized and when necessary utilized during emergency periods when some loss of insulation life may be justified in order to maintain a continuous power supply. Emergency capability may be defined as the maximum load which can be carried by a modern transformer during a rare emergency period of reasonable duration without danger of imminent electrical failure. This emergency capability of a transformer is determined by the nature of the daily load cycles, permissible voltage, ambient temperature, transformer thermal characteristics and method of cooling. Emergency loads such as those that may be imposed during equipment outages do not often occur, but may sometimes last for several load cycles until faulty equipment may be repaired or replaced.

A single emergency capability chart (Fig. 6) is based upon higher hot-spot temperatures, but in much the same manner that the normal capability chart of Fig. 5 was derived.

Emergency loads allowed by this chart may cause some deterioration of the transformer insulation, especially if the emergency exists for several days. However, single operation on this basis should not result in danger of imminent insulation failure. Thus, a transformer could be operated again at normal load until such a time when a thorough inspection can be made.

In those cases where the magnitude or the duration of the emergency load is such that an excessive sacrifice of life is apt to be suffered by the transformer, temporary water spray equipment can be used to hold the transformer temperature down to a less destructive value. Extreme care must be taken in applying water spray for heavy overloads, however, since a resulting low oil temperature may conceal a high copper to oil temperature gradient if the overload is excessive.

In no case should transformer capabilities be assigned without a thorough study of the effects of overload on voltages and amperages. The overload may produce greater voltage drop, which increases the amperage more than proportionately to the increased load in kva. This increased current will appropriate some of the transformer capability and restrict its output. The thermal ability of associated cables, switches, current transformers, meters and other circuit equipment may constitute the practical limit in load-carrying ability of the station. The facilities available for transferring load to other sources of supply in case of equipment outage will determine whether the normal or emergency capability will establish the maximum transformer load.

Forced Cooling

It is recognized that some further increases in loading may be permitted if additional or forced cooling is installed. The forced-cooled capabilities, however, are contingent upon ventilation, temperature gradients and other design features which are not evaluated in this article. Each case of this type should be taken up individually with the manufacturer as general rules have not yet been substantiated.

Barrier Boards and Scaffold Promote Safety

Mental lapse accidents in "dead" work are deterred by the use of insulated wooden reminder-obstacles — Ladder-type scaffold for "live" work

J. R. STEELE, Oklahoma Gas & Electric Co., Oklahoma City*

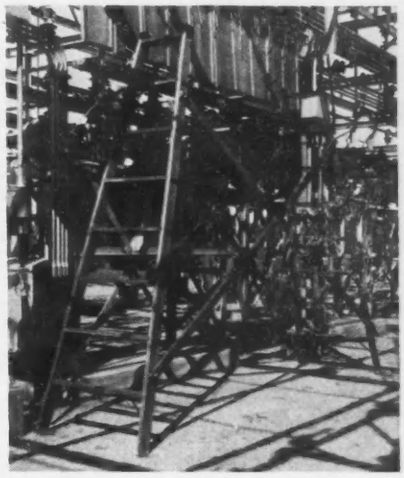
OUTGROWTH of the suggestion system are special wooden "barrier boards" that have been introduced into regular use as a precaution against "mental lapse" type accidents which occur when a man absent-mindedly enters an energized substation zone from the "dead" portion in which he is working.

Two sizes of barrier boards are used on the utility system, one 15 x 60 in. and the other 24 in. x 8 ft. Barriers are of $\frac{3}{4}$-in. oven dried spruce, well varnished, doweled and glued together. Holes are provided in the edges of individual board so that they may be tied to the steel work and to each other to form a wooden wall or barricade.

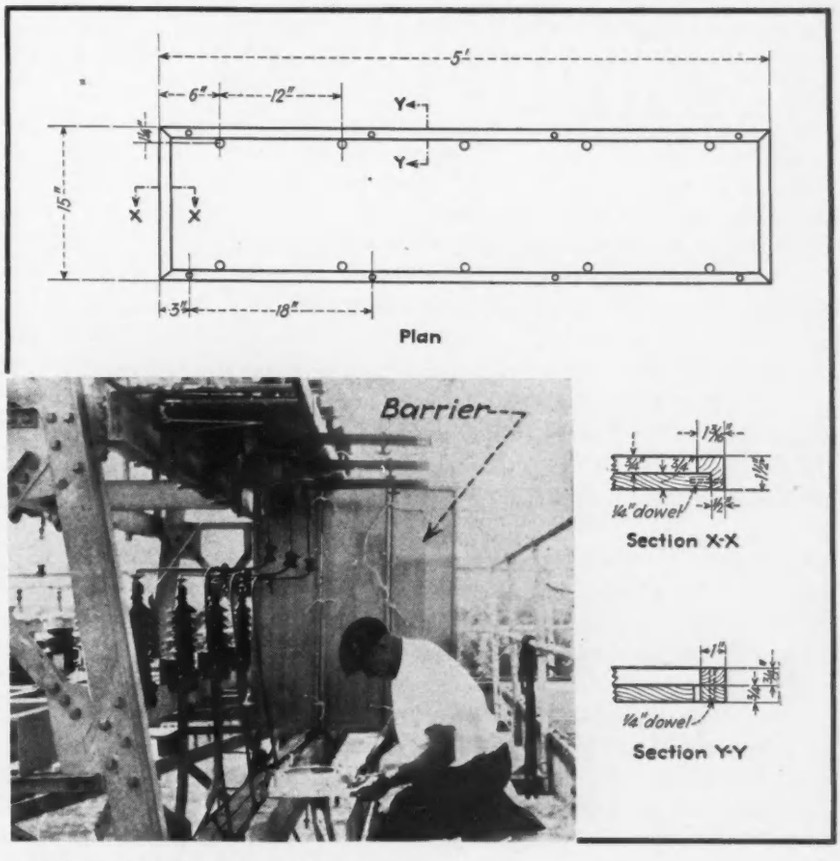
The accompanying illustration shows three of the barriers in use. An operator is shown changing lightning arresters in a "dead section" and protected by barriers from adjacent energized conductors. Note the ladder covered with rubber blankets, which lies across dead blades of the disconnects as overhead protection from "hot" disconnect clips above.

A safety scaffold of oven-dried spruce, well varnished, and with a minimum of steel in its construction, is used to reduce the danger of accidents to men standing grounded on steel substation structures while engaged in "hot" work. The scaffold, as shown in the illustration, is adjustable for height up to 12 ft. and for length from 2 ft. 8 in. to 10 ft. at the top and 6 ft. 8 in. to 14 ft. at the floor line. Each diagonal brace has three holes from the top end and four holes from the lower end for four positions of the supporting ends. Only metal is that in the brace rods ($\frac{5}{16}$ in. round) under the steps and in the bolts holding the cross braces together. No metal runs up and down the ladders.

Footboard is a standard painter's extension plank 10 ft. to 17 ft. 6 in. long by $11\frac{1}{4}$ in. wide. Safe ladder shoes are attached to each scaffold leg. First step above the floor is 18 in. and subsequent steps are 18 in. apart. The scaffold and wooden barriers used with it can be carried on a pick-up truck with an overhead ladder rack.



ADJUSTABLE SCAFFOLD used in substations



BARRIER BOARDS used as a barricade

* Superintendent of Safety.

Editorials

S. B. WILLIAMS, *Editor*

The Beginning of a New Future

AFTER HAVING its own way uncontested practically ever since the registration case, SEC must now submit its administration of the Holding Company Act for judicial review. Three separate cases have been filed (C. & S., U.G.I. and North American) which should determine the most controversial parts of the act. These actions each relate to SEC interpretation of some part of Section 11, commonly known as the "death sentence" section.

What is meant by an integrated system? Can more than one be held by a company and under what conditions? How big is too big? How far does the commission's authority extend over securities, voting power, simplifications? In fact, is the section not in conflict with the constitutional rights of people? These are some of the questions up for judicial opinion.

It is quite possible that the courts will interpret the equivocal wording of Section 11 unfavorably to the utilities, but even so that will be something positive and limiting on the administration of the act. As it is now, each new SEC staff (and there have been many changes) brings forth a more restrictive interpretation, all for the purpose of making the holding companies more and more impotent. Legal determinations should put an end to these administrative squeeze plays.

While it is greatly to be regretted that the companies found it necessary to take legal action at this time, when all of the energies of their staffs should be devoted to the winning of the war, the responsibility for that action was taken out of their hands by the SEC over a year ago when it not only refused to abide by the *status quo* for the duration but took the position that the war necessitated more prompt enforcement of the provisions of the act.

In some ways, however, this might be a blessing in disguise, for whatever the decisions are they will be stabilizing to the industry in that they will determine the cellar. The systems might be smaller and the voting control might not be in the same hands, but the uncertainty that has dried up the sources of new financing would be removed. If the utilities could go into the peace with a sound bill of financial and corporate health, even though it involved some rather serious operations, it would be very much worth while.

Every one in the industry should be glad to see this ending to the period of regulation by default. It is not the beginning of the end as some people fear. It is really the beginning of a new future.

Time to Condition the Public for Possible Rationing

A YEAR AGO in the Southeast the people could understand a sudden rationing of power because everybody knew it hadn't rained for a record number of days and therefore could see why reservoirs should be down. There is going to be no such natural means of conditioning people's minds this fall in areas where peaks exceed the capacity or where, with reserves already pressed into service, a breakdown occurs, or where a difficult fuel supply limits usage.

During these weeks of minimum demand it might be difficult to envision a time this fall or winter when civilian usage of energy had to be curtailed, and those who contend that there will be no justification for rationing might in the end be found to be right. Nevertheless, prudence seems to say that it wouldn't hurt any to condition the public mind for what might come. If it doesn't happen then the companies are just so much better than people thought they were.

Many companies have advertised to their customers that they have ample power, and so they had, but maybe they have since interconnected with some other companies not so favorably situated, or they may have been saddled with a big war load.

While it is good publicity for a company to tell its customers how well it has planned, and how no local inconvenience has resulted so far, there can be no harm in warning the public that even the best-laid plans can be short of the goal in war-time. A virtue can be made of the things that might happen. Then if they do happen the public is ready.

The industry does not want to have any of the public unrest that attended the gasoline rationing, because any tampering with the public use of electricity touches home too closely. If the public mind is not conditioned the clamor might result in a demand for an overload of the industry and the goat would be the utilities.

Official Blackout Rules

AT LONG LAST, and long it was, the Army has set down the official specifications governing blackouts and materials in areas where it orders blackouts. Unfortunately, all of the permissible equipment will not be available until WPB determines what materials and how much will be permitted and on what priorities.

Those familiar with English practice and equipment will wonder, after reading these specifications, why their preparation should have taken so long. Some of this perhaps is due to the fact that we wanted to be sure that we had the best for our particular conditions. Many

tests were made in the air at different heights and speeds with many different ground conditions. One of the things that came out of this exploration, it will be recalled, was the smashing of the blue light fallacy.

These new specifications then, while they may be imperfect in some respects and may run counter to the viewpoint of others, are nevertheless the result of careful, sincere work. Nor has the Army wanted to disturb civilian life any more than was felt to be absolutely necessary. One is glad to note that the specifications discourage extinguishment, laying emphasis upon orderly conduct of civilian activities, safety and morale. The method favored is obscuration, which simply prevents light from leaking out.

However, if advance preparation has not been made for obscuration, then out go all the lights. This, the Army says, will produce objectives sought by the enemy. It is therefore advisable for the public to get busy now, and in this the electric light companies can be of great assistance.

The rules are now laid down, there can be no excuse for further delay.

Shocking, Nevertheless

IT IS SAID that an honest confession is good for the soul, but that presupposes that it is made in a penitent attitude. When, however, a confession is made in a challenging manner one is apt to be shocked by its very boldness.

Within the month the South Carolina Supreme Court has had occasion to act on a petition by the South Carolina Public Service Authority (Santee-Cooper) for a rehearing of the decision denying it permission to purchase certain Associated properties. The petition was denied, but the brief of the Authority thoroughly "spilled the beans" on the reasons for government financing of public power projects. Although there wasn't anything in the brief that people had not generally taken for granted, it was most startling to have this confession come out so soon after the government had so successfully contended differently in its yardstick case.

The brief states that with the former Supreme Court in existence government had to resort to the subterfuge of setting up provisions of generally accepted "public purpose," "while at the same time everybody understood and now knows it as a fact that the object of the named projects (Bonneville, TVA and Boulder), and of scores of others that have since been undertaken, was to socialize, so to speak, the business of producing and distributing electric energy through public grants and public ownership."

"With the change in attitude of the Supreme Court of the United States," the brief goes on to say, "this element in legislation was found to be unnecessary."

Well, there it is, just as everybody thought. Navigation improvement flood control, soil erosion prevention, a true yardstick, reclamation, were all window dressing—subterfuges behind which to plead when the Supreme Court acted as an unprejudiced judicial body.

Certainly the government has secured enough decisions from the new Supreme Court to warrant its belief that that body will not be antagonistic to New Deal legislation, but we doubt if the public is yet ready to accept such bold declarations that the court is in effect a rubber stamp and we believe that the new justices are beginning to sense that attitude.

Chief Justice Stone but a few days ago pointed out in an address that the present court had considerable independence of mind and cited several recent five to four decisions as proof of his contention. We shall have an opportunity to see whether this judicial independence extends to utility questions when the several disagreements with SEC over its interpretation of the Holding Company Act come before the court for final determination.

Prize Awards Need Revitalizing

ONE of the features of the annual meeting of the Edison Electric Institute is the awarding of prizes for achievement of one kind or another. Some of these go to companies and some to individuals. Some of these have been in existence a great many years and others are of more recent origin. All of them are very generous.

Although these prizes are given to stimulate a great industry to better work, better thinking, better results, the caliber of the submissions must at times be disheartening to some of the donors. Not only that, but the number of submissions appears to indicate a lessening interest. There have been years when for some prizes there was not a single submission. There also have been times of late when submissions, although they qualified under the terms of the award, were not of sufficient merit to warrant such distinction.

When the judges have no choice but to give the award to the best of those that qualify under the rules, regardless of how uninspiring the submission may be, something should be done to make sure that awards will be made only for really meritorious achievement.

Undoubtedly many people have been discouraged in the past because they sent in entries and nothing happened. Others may feel that they are too busy to give the time to a gamble, and still others may feel the judges are perfunctory in their duties and therefore more impressed with form and less with substance.

On this latter point it can be said that the judges are extremely painstaking, thorough and unprejudiced. The time they give to the judging warrants a better selection than has been placed before them many times in the past few years.

We suggest that the Edison Electric Institute, under whose auspices these awards are made, review the terms of these awards with the donors or their representatives to find ways in which these competitions can be made to accomplish the fundamental purpose for which they were set up. We are sure it can be done.

Washington Comment

By GEORGE E. DOYING, Jr., Washington Correspondent

Who Does What in Power Rationing?

THE INEVITABILITY of electric power rationing is taken for granted these days within the war agencies. The questions are when and where, how long and how much rationing there will need to be—and what considerations will determine these answers.

This is not to say that the War Production Board is looking for an excuse to impose widespread curbs on utility operations; to get a clear picture of what is coming it is necessary to accept a quite contrary premise. Any consideration of the sufficiency of power today must take into account that, so far as war planning is concerned, power is no longer entirely an isolated commodity. It is, in addition, a component of the whole fuel and energy picture.

Tooling-up Phase Over

On this basis the mere adequacy of generating capacity to meet loads is not necessarily the determining criterion. Artificial and arbitrary factors are going to affect power; just as drought conditions forced curtailment in the Southeast last fall, so could inadequate allocation of oil or coal bring on curtailment in New England (for example) next winter.

In other words, the tooling-up phase of the war is about over. Now comes the period in which the government directs how the machine is to be operated to win the war. This contemplates regulating the civilian half of the economy quite as completely as the war half.

Does this mean that the power branch of the War Production Board is to atrophy, or at least be demoted to a secondary role? No, it doesn't. The very complexity of the problem of government supervision of the vast war machine requires the counsel and administrative skill of trained technicians. Only the job changes, from one concentrated upon getting materials for expansion and more effective generating and transmission facilities to one of activities such as those which had a brief showing last fall in Atlanta.

The power branch is going to administer power rationing. That was the procedure tested at Atlanta, and there is no disposition in Washington to upset it. At least so long as the Nelson organizational concept of delegating maximum authority to a "strong man" administrator lasts, administration of power rationing will be with the widest possible functional latitude so far as it affects utility operations. Utilities, in other words, will be taking instructions from and reporting directly to the power branch representing WPB.

In addition, the power branch today has an unrestricted grant of authority from WPB to invoke the provisions of Limitation Order No. 94 whenever emergency conditions require kilowatt or kilowatt-hour use curtailment.

Division of Civilian Supply

When, however, it comes to more than short-duration emergency restrictions, the broad determinations of when and where to ration power and of what classes of customers and uses of energy are to be rationed will be made in Washington by the War Production Board's "top side"—the policy-making offices of Director J. S. Knowlson of Industry Operations or the Requirements Committee.

How does "top side" decide these matters? By consulting with both the "line" agency involved, in this instance the power branch and the "staff" agencies of WPB, plus the Army-Navy Munitions Board and, in power matters, under terms of the April 30 "treaty" between WPB and the Federal Power Commission—with FPC.

Enter, then, the Division of Civilian Supply of WPB, a staff agency consisting of specialists in the economic and human effects of things, as contrasted with the engineering and operational effects. Civilian Supply is considered a vital part of the war administrative machinery, with a positive role of advising "top side" on what are the minimum requirements for a civilian standard of living—a minimum above which facilities could be taken for war uses, but below which the war program should not be allowed to interfere. Civilian Supply also is charged with keeping the civilian programs meshed—see to it, for instance, that the steel allocation program which allots metal for laundry maintenance is not negated by a power curtailment program cutting laundry kilowatt-hour consumption by half.

Curtailable Loads

So long as the problems in the utility field had to do almost entirely with matters pertaining to readying the industry for its part in the war program, "top side" consultation was virtually limited to the technicians—the power branch. Even last fall Civilian Supply was not set up to participate actively in the determination of policies for the Southeast program, although it was consulted and delegated its authority to power branch.

Now, with curtailment looming as a regular thing, Civilian Supply is turning its attention to the entire fuel situation, working alongside the power branch technicians, for the power end of the job, in preparing regional data on "curtailable loads" upon which to recommend rationing policies if and when—and where—necessary. Either power branch or Civilian Supply may propose a rationing program—the one because of operating or facility deficiencies, the other perhaps to balance a fuel situation.

There is, it may be reported, active disagreement between the Civilian Supply power staff and the power branch on some policy phases of power rationing. There is not, however, any fundamental disagreement over jurisdiction between the two agencies. The disagreements are over such matters as how to determine what classes of use should be rationed and how much, etc., not over administration of whatever rationing is determined upon.

NEWS OF THE WEEK

Advertising in Wartime is Theme of P.U.A.A. Meeting

Transition from appliance merchandising copy to consumer education, service and institutional messages brought out in utility advertising executives meeting — Clara Zillessen elected new president

The problems confronting the electrical industry's advertising executives, in a country at war, occupied the attention of most of the delegates attending the annual convention of the Public Utilities Advertising Association, held this week at the Hotel Commodore, New York City. Cessation of appliance manufacture, the need for maintaining appliances in service for the duration and the public relations job required to acquaint the public with the utilities' contribution to the war effort were all subjects coming in for attention in talks.

"Hell Box" Discussion

In the first day's session the meeting was called to order by Al C. Joy, advertising manager of the Pacific Gas & Electric Co. and president of the PUAA. Henry Obermeyer, assistant vice-president of New York's Consolidated Edison Co., made the address of welcome and the remainder of the session was devoted to a "hell-box" round-table discussion of the problems, griefs and accomplishments of the members. This informal session, under the guidance of E. K. Hartzell of East Tennessee Light & Power and E. N. Pope, Carolina Power & Light Co., brought out vigorous discussion on the need to break loose from straight selling copy in utility advertising and do an institutional and service job. Emphasis was placed on the need to tell the customer the problems the war brought in maintaining utility service.

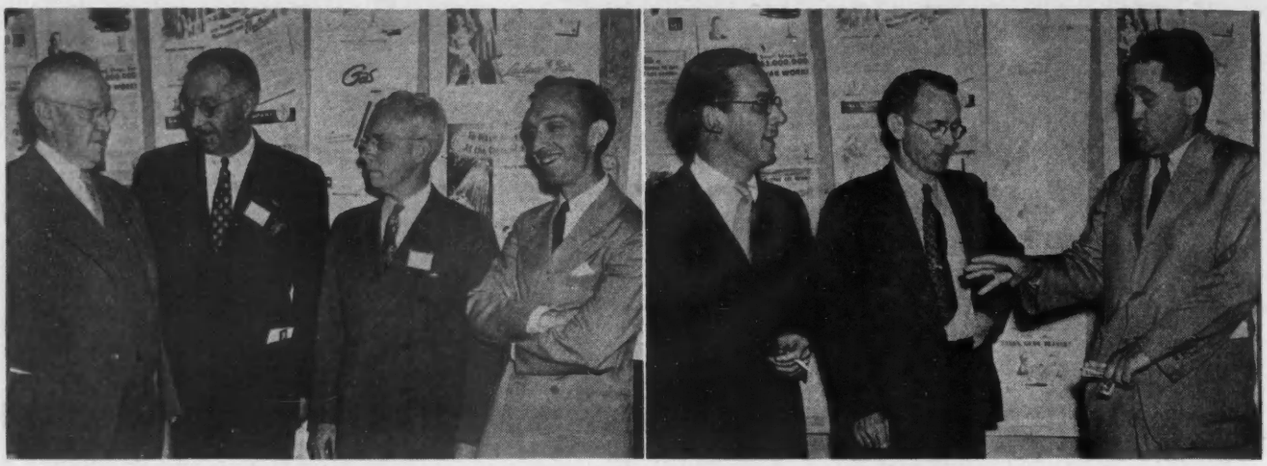
In the second day's session Ashton B. Collins of "Reddy Kilowatt" Service reviewed the thinking of power company executives since the advent of Pearl Harbor. Immediately after the country's entry into the war, Mr. Collins said, operating companies practically stopped advertising until they could adjust themselves to the changed conditions. Merchandise advertising had to stop and a program of customer education on appliance care, nutrition, service and the company's contribution to the war effort took its place. Selling the use rather than the merchandise took precedence in copy directed to post-war conditions.

C. J. Allen of the Connecticut Light & Power Co. discussed the power company's problem in the smaller communities where budgets for newspaper and other promotional media were at a minimum.

George E. Whitwell, vice-president of the Philadelphia Electric Co., warned the advertising men that space filling was out and that utilities had a public service to perform in customer education. He listed ten points for admen to concentrate upon, including possible rationing of residential use, appliance maintenance and repair, service facilities and nutrition.

A symposium, "What We Have to Tell Mrs. America," comprised talks by Ernestine Becker of Johns Hopkins University on "Food for Fitness" and discussions by Elizabeth Murray of Atlantic City Electric on the electric power company's contribution to the nutrition program. W. J. Weir of Lord & Thomas, advertising agency, gave the delegates some tips about what to do with their advertising space. The effect of the war on utility advertising was completely covered by Davis M. Debard of Stone & Webster Service Corp., and Edwin Vennard, vice-president Middle West Service Co., discussed the place of electric companies under business management.

P.U.A.A. DELIBERATIONS—Al C. Joy, Pacific Gas & Electric Co. and president, Public Utilities Advertising Association. Tom Spain, Public Service Electric & Gas Co., and Howard Weeks, Consolidated Edison New York, go into a huddle on convention agenda



DISCUSSING WAR COPY—Left: Frank R. Jamison, Public Service of Colorado; H. P. Hoheisel, Oklahoma Gas & Electric; Ashton B. Collins of Reddy Kilowatt, and R. I. Seymour of Kansas City Power & Light Co. in a friendly confab between P.U.A.A. sessions. Right: J. R. Pershall, Public Service of Northern Illinois; E. N. Pope, Carolina Power & Light Co., and E. K. Hartzell of East Tennessee Light & Power Co., exchange banter between sessions

At the luncheon, on the second day, the Better Copy Committee of PUAA announced the annual awards under the chairmanship of R. I. Seymour of the Kansas City Power & Light Co. National awards were as follows:

Public Relations—Cincinnati Gas & Electric Co. *Electric Load Building*—Public Service Electric & Gas Co., Newark, N. J. *Electrical Merchandising in Newspapers*—Indianapolis Power & Light Co. *Gas Load Building*—Boston Consolidated Gas Co. *Gas Merchandising*—Pacific Gas & Electric Co. *Campaigns*—Connecticut Light & Power Co. *Transportation*—Wisconsin Public Service Co. (Green Bay). *Employee Magazines*—Niagara Hudson Power Corp. *Employee Newspapers*—Cincinnati Gas & Electric Co. *Residential Bill Inclosures*—Southern California Edison Co. *Residential Direct Mail*—Connecticut Light & Power Co. *Industrial and Commercial Direct Mail*—Nebraska Power Co. *Special Booklets*—West Penn Power Co. *Window and Inside Display*—Philadelphia Electric Co. *Outdoor Advertising*—Philadelphia Electric Co. *Radio*—Duquesne Light Co. *Annual Reports*—Texas Power & Light Co. *Motion Pictures*—Pacific Gas & Electric Co.

Clara Zillessen, advertising manager of the Philadelphia Electric Co., was elected president of the association, succeeding Al C. Joy. Thomas Spain, Public Service of N. J., was elected first vice-president; J. MacDonald, Boston Edison, second vice-president; R. I. Seymour, Kansas City Power & Light, third vice-president; Waldo Wright of the Amarillo (Tex.) Gas Co., secretary, and Dale Remington, Wisconsin Public Service Co., treasurer.

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TVA Pays $1,859,146 in Lieu of Taxes

A total of $1,859,146 in lieu of taxes will be paid to states and counties in the Tennessee Valley by TVA in the fiscal year ending June 30, according to Gordon Clapp, general manager. The amounts include: Kentucky, $37,436; Kentucky counties, $5,342; Tennessee, $509,993, and Tennessee counties, $27,821. All the figures represent increases over last year.

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Robinson Flays Bone Bill—

The current version of the Bone bill to establish an Ickes-controlled Columbia River Administration similar to TVA, but in the Northwest, would "wipe out every private distributor of electricity in the area . . . regardless of the will of the people or rates being charged by the private company," Kinsey M. Robinson, president of Washington Water Power Co., told a joint House-Senate committee holding hearings on the bill.

"The Administration can, if the bill is enacted, by means of federal condemnation take over the property of the Washington Water Power Co., which I represent, even though 90 percent of revenue and 81 percent of the population of the company are in areas where public ownership has been defeated or where no elections have been held," Mr. Robinson stated.

Flays Condemnation Proceedings

The condemnation proceedings contemplated by the bill he labeled "nothing less than a firing squad method of seizure." The bill permits the proposed Administrator to take over utilities merely by posting his estimated fair price with a court—a method commonly used where properties are to be converted to other uses, but never, as Mr. Robinson pointed out, where the property is being taken over for continuance of its present function.

Mr. Robinson ridiculed testimony of proponents of the bill that it is needed to get the maximum efficiency from existing facilities for the war.

"With the interconnections now being made and others contemplated every kilowatt of capacity and every kilowatt-hour of energy in the area that can be made useful will be conserved for the war effort," he stated. "In short, all the facilities of the government bodies and the electric companies are being put in one big pool so that the maximum efficient use of all existing facilities are made available for the war effort. No new group can take these generating plants and water storage facilities and get the amount of capacity and energy out of them that the group now operating them are getting." He urged the committee members to condemn the efforts of the proponents to "stampede legislation through Congress in the name of patriotic duty, which, in fact, is only the pretext for such legislation."

Among the parade of government witnesses before the committee has been Secretary of the Interior Ickes, under whom the proposed administrator would serve. He testified that it would be "governmental stupidity" to sell Grand Coulee and Bonneville energy to utility companies. "I would rather the dams had never been built than that they should become monuments to government stupidity to the people's interest," he said. "I don't believe that we have any right to invest the people's money in order to make money for the stockholders of private companies."

Ickes, as have other government witnesses, urged the war necessity of replacing the existing Bonneville Administration with a Columbia River Administrator with revenue-bond issuing authority to buy out existing properties. No interconnections, he said, can "compare with the value of a single integrated and balanced system."

WPB Revises Repair Materials Rating

A-1-C rating given for as much as 30 percent of the necessary maintenance and repair materials in the latest revision of the P-46 order

Utilities are given an A-1-C rating for as much as 30 percent of their necessary maintenance and repair materials in the latest revision of the industry's basic P-46 order issued this week to extend the life of the procedure through the third quarter of 1942.

The A-1-C rating, third highest in the normal priorities alphabet, becomes available July 1. It may be self-applied to utility purchase orders in the same manner as P-46 ratings already have been applied, by the utilities over their own indorsement. The rating may be used only to obtain materials to repair breakdowns "or to make reasonable advance provisions for such repair." It may be used also for not more than 30 percent of the amount of each class of material a utility is permitted to accept in a quarterly period under Section F of the order. It is important to note that this 30 percent limitation applies to each class of material and not to the over-all dollar volume of R & M purchases.

Other Ratings Remain

For other purchases of maintenance materials, the A-2 rating for production equipment and the A-5 rating for distribution equipment which were made available in March remain in effect. In addition, it is provided that, as a matter of policy, the power branch will rate extension projects to serve war loads at the same priority level as the project to be served. Thus utility application for extension of service to an army camp having an A-1-A construction rating will also get an A-1-A rating. Where such a project has two or more ratings, the utility extension takes the lowest of the project ratings.

An important change in the limitation section of the order eliminates the permission for building lines up to 250 ft. without advance WPB approval. All new lines except to connect houses already wired or, in the case of new buildings except where the foundations have beeen completed by July 1, must be approved in advance by the power branch—whether or not new materials are required. The provision permitting new construction using up to $1,500 worth of materials underground or $500 worth of materials elsewhere without advance OK is retained in the order, however.

For the first time in this version P-46 becomes available to Canadian utilities, publicly or privately owned, which are willing to accept the limitations in order to obtain the priority ratings for American materials. Application is made to the War Production Board, Washington, Reference, P-46.

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National Pushes Dissolution Steps

Nearly 300 investment banking houses and securities dealers throughout the country began solicitation last week of exchanges of National Power & Light Co. preferred stock for the common stock of Houston Lighting & Power Co. The solicitation was authorized recently by the SEC as part of a program for National Power's dissolution under the "death sentence" provisions of the Holding Company Act.

Under the terms of the offer, National is offering to each preferred-stock holder the right to exchange such stock for Houston Lighting & Power common, on the basis of two shares of Houston common for one share of National $6 preferred, with appropriate dividend adjustments. Outstanding are 500,000 shares of Houston common. As a result of exchanges which took place prior to the employment of securities dealers to facilitate the transaction, National's ownership of Houston's stock had been reduced by June 6 to 387,718 shares. On the same date National had outstanding 223,575 shares of $6 preferred, of which 6,411 had been classified as no longer eligible for exchange.

To enable the securities dealers to canvass the large list of holders adequately, the time permitted for the exchanges has been held open until August 14. The exchange offer was originally made as of January 30, 1942, but without the assistance of the dealer group.

An additional step toward compliance with the SEC dissolution order was taken by National Power & Light Co. recently with the filing of an application with the commission which it proposes to acquire all or part of the $330,000 face amount of non-callable, 50-year, 5 percent collateral trust mortgage gold bonds, due July 1, 1951, of Lancaster County Railway & Light Co., assumed by National.

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Equipment Rating Snags Ross Dam

On request of City Light Superintendent E. R. Hoffman, the Seattle City Council has withdrawn the call for bids on the $7,900,000 bond issue to finance the construction of the proposed addition to Ross Dam at the Skagit project. Bond bids were to have been opened June 22 and bids for the construction contract June 18. Withdrawal of the bids was made after Hoffman had been advised that the A-1-C priority rating recently given the dam project covered only materials used in the dam itself and did not include contractors' tools and equipment.

After a call from WPB, Hoffman left immediately for Washington to work out a solution on complete coverage of priorities for the project. Unless contractors' equipment is included in the rating, Hoffman said, it is not considered likely that bids for the construction contract would be received.

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Senate Allows TVA Its Revolving Fund

Senator Kenneth McKellar of Tennessee, chairman of the Senate appropriations committee, has surrendered to the House on the Tennessee Valley Authority appropriation bill, which means the agency keeps unrestricted use of its power revenues for operating expenses and continues to maintain a common fund in the treasury.

As reported by the conference committee, the TVA section of the independent offices money bill for the fiscal year beginning July 1 restores the House appropriations and language which the Senate had changed at McKellar's insistence (ELECTRICAL WORLD, May 16, 1942, page 59). Total TVA appropriation for its regular and wartime construction in the next year is $136,000,000. In addition, its power and other revenues are estimated to add up to another $36,000,000.

The House won the dispute by instructing its conferees not to surrender on the TVA section of the bill, a parliamentary move which is usually followed by acceptance from the representatives of the other chamber. McKellar's bill to accomplish his objective by amending the TVA law is still buried in another committee.

Service Standards for War Housing Defined

New specifications and procedure issued by WPB's power branch to replace stop-gap plan; single set of regulations to rule service connections in both public and private war housing

The WPB power branch issued this week a new and much more detailed set of specifications defining permissible utility service standards for war housing projects. At the same time it also announced that all future authorizations for utility service housing extensions will be issued simultaneously with the project authorizations and by the same offices.

Replaces Stop-Gap Plan

The new specifications and the new procedure replaces the stop-gap plan put into effect in May for dwelling units already built or building (ELECTRICAL WORLD, May 23, page 6). The idea is to bring under a single set of regulations the standards of utility services to be built into war homes and those which utilities will be permitted to connect. It is also intended to prevent repetition of the situation which resulted in thousands of homes being built while utility service connection applications were being held up on the ground that they required excessive amounts of critical materials.

Procedure under the new arrangement differs between publicly and privately financed housing, but the service standards apply in either case and the power branch requires utilities to satisfy themselves that the project plans meet these standards before applying for permission to use materials in making the connections.

In the case of government projects, utilities will be asked by the Federal Public Housing Authority to file with that agency application to make service extension on Form PD-545. The request to fill out Form PD-545 in the case of a privately financed project will be made by the builder, after he has received word from the Federal Housing Administration field office that his project is acceptable.

Filing the PD-545 form with either FPHA or FHA constitutes compliance with paragraph E-2 of priority order P-46 (covering new construction) so far as the power branch is concerned. Approval will come from the appropriate housing office in the form of a letter similar to those now issued by the power branch. This letter grants the utility authority to withdraw materials from excess stocks or to acquire necessary conductor, transformers and meters from other utilities. For new materials which must be purchased utilities will get a rating equal to that of the housing project.

The new service standards are intended to provide only bare minimums, so that the least amount of critical materials will be consumed in providing war housing. No service, for instance, may exceed the shortest possible distance from the distribution line to the point of connection, and when complete or partial joint service for two adjacent structures will take less material than individual lines, the joint installation must be made.

The copper allowance permitted under the temporary May set-up is further restricted by the new standards. New single-family homes may have up to 30 pounds of copper, the same as before, but one-family semi-detached and two-family detached units are permitted only 25 pounds per unit, row and multiple family buildings 20 pounds per unit and dormitory projects six pounds per person. These figures include all service drop, secondary, primary and grounding conductors.

Conductor Use Limited

Use of conductor is limited to the least poundage which, with steady voltage, will deliver a specified maximum peak demand, depending upon the number of units in a project and the electrical requirements. For instance, a project of 100 units is allowed 350 watts peak demand per unit for lighting only, 375 watts per unit for lighting and refrigeration and one kilowatt per unit when cooking and hot water are added. For 1,000-unit projects the figures are 200, 225 and 800 watts respectively. The same figures for a single house are 600, 725 and 2.8 kw.

Distribution facilities must be designed on a voltage spread of 105 to 125 measured at the entrance point to the branch circuits. Voltage control only to drop nuisance is prohibited. Transformer capacity may not exceed the applicable peak demand.

For street lighting, projects which do not extend more than 1,000 feet from existing lights are not permitted additional lights. Otherwise, one light per 1,000 ft. of street is permitted. Conductor may not exceed 50 percent of the total lineal feet of streets and only overhead steel conductors may be used.

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FPC Fixes Original Cost of Niagara Power

Settling a controversy which has existed for 20 years, the Federal Power Commission last week fixed the "actual, legitimate, original cost" of the Niagara Falls Power Co. hydro-electric project (No. 16) at Niagara Falls, N. Y., at $24,680,680, as of March 2, 1921, exclusive of items totaling $3,985,500 reserved for further consideration. The FPC further disallowed $15,787,688 of the $44,453,868 book cost of capital in service on the 1921 license date.

In its decision the commission rejected the company's "fair value" claim and classed a write-up of $11,800,482 on the company's books as a flagrant example of outright inflation. The Niagara Falls Power Co. did not possess any valid existing permit, right-of-way or authority from the federal government when it applied for a license under the water-power act, the commission held. Most of the amounts disallowed in determining the actual legitimate cost of the project, the commission said, represented write-ups placed on the books of the licensee's predecessor companies—Cliff Electrical Distributing Co., Hydraulic Power Co. of Niagara Falls and the Niagara Falls Power Co., which were consolidated into the present company by a special act of New York's Legislature in 1918.

In disallowing the $328,471 write-up on the books of the Cliff Electrical Distributing Co. the opinion states that the Cliff company was organized in 1909 and that the properties originally owned by the Schoellkopf interests were transferred to the Cliff company—a transfer effected by the Schoellkopfs to divorce their distribution facilities, which subjected them to regulation upon passage of the New York Public Service Commission law in 1907, from the balance of their property. "There was no semblance of arm's length bargaining in this transaction," the commission observed in its report, "which effected no change in the ownership and control of the property."

Discussing the total disallowance of the $11,800,482 write-up on the books of the Hydraulic Power Co. of Niagara Falls, which was transferred to the books of the Niagara Falls Power Co. in the 1918 consolidation, the commission said that the book cost of the Schoellkopf properties were increased by that amount without "a dollar of additional investment and without any change in the stockholders or the property."

War and Peacetime Conversion Occupy A.I.E.E.

Opening sessions of 58th annual convention get under way in Chicago: Engineers urged to adopt long-range view; Lamme Medal awarded to Ricketts; Harold S. Osborne elected new president

A hard-working, war-time, midsummer convention of the American Institute of Electrical Engineering got off to a fast start at its opening sessions in Chicago earlier this week, with Institute officials and featured speakers calling for straightforward, hard-headed, practical thinking on the part of engineers to meet today's war problems and the conversion problems of the peace that will follow.

In his opening remarks as incoming president of the Institute, Harold S. Osborne, American Telephone & Telegraph Co., said engineers as a group can be more influential than they know in guiding public thinking about the war. The man on the street must not come to blame government or its agencies for scarcities and inconveniences that are inevitable. In this and in damping undue waves of optimism or pessimism, engineers, he asserted, can guide the public mind from dangerous channels. Being close to production problems, engineers can also do much to foster a long-range view of existing conditions and cultivate a clear-headed view of war problems.

REGISTRATION GETS UNDER WAY—Many informal groups gathered for discussion at the opening session of the summer convention of the American Institute of Electrical Engineers at the Drake Hotel in Chicago. Left to right: A. Dovjikov, Bonneville Power Administration, Portland; A. C. Monteith, Westinghouse; R. T. Henry, Buffalo, Niagara & Eastern Power Co.; C. F. Wagner, Westinghouse and J. R. North, Commonwealth & Southern, Jackson, Mich.

A.I.E.E. CONVENES IN CHICAGO—Engineers from all sections of the country attended the summer convention of the American Institute of Electrical Engineers held this week at the Drake Hotel in Chicago. This General Electric group got together for discussion: (left to right) T. G. Glen, Detroit, Mich.; C. J. Schaus, Chicago; P. L. Alger, Schenectady, N. Y.; C. W. Fick, Cleveland, Ohio; A. L. Jones, Denver, Colo.; Murray Graff, Denver

Outgoing Institute president D. C. Prince, vice-president of the General Electric Co., called upon the profession to plan, well in advance, the mechanics of conversion to peace-time production. It calls for careful advance planning, particularly in the accommodation of production to available purchasing power after the war, if conversion is to be smooth and without displacement of labor. The post-war era will be one of intense competition, he foresaw, and although such competition will be largely healthy, it could become unhealthy, he declared, if too many competitors enter a single field and compete against each other for survival.

A feature of the first session of the convention was the presentation of the Lamme Medal to Forrest E. Ricketts, vice-president of Consolidated Gas, Electric Light & Power Co. of Baltimore, and "father of modern selective relay protection."

Five prizes were awarded during the meeting for best papers on different subjects. Recipients were: G. A. Matthews, Detroit Edison Co.; J. H. Hagenguth, General Electric Co.; Edith Clarke and S. B. Crary, General Electric Co.; M. J. Delerno, enrolled student, and R. T. Basbett of Tulane University.

OPA Voids "Package" Appliance Deals

Certain types of "package deals" involving radios, phonographs and household appliances, in which customers must purchase an unwanted item with a wanted one, are violations of the General Maximum Price Regulation, Price Boss Leon Henderson ruled this week.

Henderson's action was expressed in a telegram to 65 radio and phonograph manufacturers, 44 electrical associations and ten mercantile associations. The telegram read:

"Distributors of radios, phonographs, and household appliances in various localities are requiring customers to buy unwanted merchandise in order to obtain supplies of certain articles such as radios and radio-phonograph combinations. This practice is a violation of the General Maximum Price Regulation in all instances where the same requirement was not imposed in March. It is not unlawful to offer so-called package deals at a reduction below the aggregate price of individual items therein, but any person to whom a package deal is offered is entitled to buy any of such items separately upon tender of the seller's maximum price in March to the same general class of customer for the item in question. Would appreciate your cooperation in disseminating this information.

NEWS BRIEFS

K. P. APPLEGATE, general manager Hartford Electric Light Co., was the recipient of congratulations from his associates when he recently celebrated his thirtieth anniversary with the company.

He was presented with a suit case. Mr. Applegate entered the engineering department of the Hartford utility following graduation from the Rensselaer Polytechnic Institute in 1912.

DURING THE TOTAL BLACKOUT in the nation's capital on June 17 inspectors touring the city for possible "leaks" were surprised to see glowing lights lining either side of the highway, especially along the parkway lawns. To the complete chagrin of all concerned, it was found that the bright glow was eminating from the myriads of fireflies formerly "outglowed" to oblivion by the dazzling street lights. The sector warden remarked: "That sheds a new light on blackouts. Guess we'll have to train moths to cover 'em up"!

THE NAVY "E" PENNANT for excellence in war production has been presented to the Bound Brook, N. J., plant of the Bakelite Corp.

FIFTEEN PLATOONS of Commonwealth Edison defense corps members, wearing protective helmets and official armbands, passed in review as part of Chicago's recent United Nation's Day Parade. Corps members have been in training for months as auxiliary firemen, police and first aid workers to supplement fire and police departments in case of air raids or other emergency.

THE AIRCRAFT CARRIER LEXINGTON, recently sunk in the Battle of the Coral Sea, once provided the city of Tacoma with almost its entire supply of electricity. During a hydro-electric power crisis due to extreme low water in November and December of 1929 the *Lexington*, with her huge electrical generating machinery, was ordered by the government to Tacoma, arriving December 15. The ship was the city's power plant for three weeks.

Clarify Interchange of Excess Stocks

Utilities seeking to purchase excess inventory stocks of other utilities to make war housing connections under the power branch regulation of May 18 (ELECTRICAL WORLD, May 23, page 6) need only indorse their orders with the P-5 rating of Order P-46. Or, in appropriate cases, purchasing utilities may supply selling utilities with copies of letters from WPB authorizing purchase of materials from other utility inventories.

Seller utilities are permitted to honor such orders without regard to any regulations of the M-9 (copper) series of orders and without considering the material sold as a withdrawal within the meaning of P-46. The material, however, is not to be replaced by the seller utility.

Power branch has obtained from the Office of Price Administration a finding that such interutility transactions shall be at prices which do not exceed the cost to sell, "plus reasonable handling charges, including warehousing, delivery and overhead as normally computed by the seller in his own operations." In no event may the price exceed the OPA wire and cable price maximum, plus the handling charges.

MEETINGS

American Institute of Electrical Engineers—Pacific Coast Convention, Hotel Vancouver, Vancouver, B. C., September 9-11. H. H. Henline, national secretary, 33 West 39th St., New York, N. Y.

Pennsylvania Electric Association—Annual meeting, Bellevue-Stratford Hotel, Philadelphia, Pa., September 11. A. B. Millar, managing director, State Street Bldg., Harrisburg, Pa.

International Association of Electrical Inspectors—Northwestern Section, Portland Hotel, Portland, Ore., September 14-16, F. D. Weber, secretary, P. O. Box 70, Portland, Ore. Southwestern Section, Fresno, Calif., September 21-23, H. L. Gerber, secretary, Room 205, City Hall, San Francisco, Calif. Western Section, Book-Cadillac Hotel, Detroit, Mich., October 5-7, F. H. Moore, secretary, 320 N. Meridian St., Indianapolis, Ind. Eastern Section, Boston, Mass., October 12-14, F. N. M. Squires, secretary, 85 John St., New York, N. Y. Southern Section, Richmond, Va., October 19-21, C. M. Jones, secretary, 307 Trust Company of Georgia Bldg., Atlanta, Ga.

Illuminating Engineering Society—Annual Convention, Hotel Jefferson, St. Louis, Mo., September 21-22. Frank G. Horton, executive secretary, 51 Madison Ave., New York, N. Y.

Indiana Electric Association—Business meeting, Indiana War Memorial Bldg., Indianapolis, Ind., September 24-25. R. E. Blossom, secretary, 1414 Circle Tower, Indianapolis, Ind.

Previously Listed

American Society of Agricultural Engineers—Summer meeting, Milwaukee, Wis., June 29-July 1. Raymond Olney, secretary, Saint Joseph, Mich.

Society for the Promotion of Engineering Education—Annual meeting, Columbia University, New York, N. Y., June 29-July 2. F. L. Bishop, secretary, University of Pittsburgh, Pittsburgh, Pa.

Standard Power Ordered Dissolved

Dissolution of the Standard Power & Light Corp., which it characterized as a useless "corporate shell," was ordered by the Securities and Exchange Commission last week. The dissolution of the company, parent concern of the Standard Gas & Electric Co., was ordered under Section 11 (b) (2) of the holding company act.

In its order the SEC directed Standard to submit a plan for its prompt liquidation, warned the company not to take any step for divestment of its securities or assets without making application to the commission, and reserved for itself the right to propose a plan of liquidation if it deems necessary.

The only functions of Standard Power & Light, the SEC said in its decision, were the exercise of the voting rights of the common stock of the Standard Gas & Electric Co. and the fulfillment of a few other routine corporate activities.

Performs Only Voting Function

"Viewed realistically," the SEC said, "Standard Power is no more than a corporate shell, holding blocks of securities sufficient in quantity to elect at least four directors out of nine of the board of its subsidiary Standard Gas & Electric Co. For its subsidiaries Standard Power performs no functions whatever and is in no position to be of any benefit to them. . . . Moreover, we find upon an examination of the pyramid of companies which constitute the Standard Power intergrated holding company system that there are five tiers of companies."

Standard Power owns no property, SEC pointed out, its assets consisting entirely of securities of other corporations. It owns 53.64 percent of the common stock of Standard Gas, whose consolidated assets on December 31, 1940, were stated at $777,116,459. Outstanding capitalization of Standard Power as of December 31, 1941, included $851,350, represented by 34,054 shares of $7 cumulative preferred stock, no par value, with a preference in liquidation of $100 a share and dividend arrears; 1,320,000 shares of $1 par common and 110,000 shares of series B common, no par value, with rights reserved with respect to 330,000 such shares surrendered and canceled.

The SEC found that the liquidating preference of Standard Power preferred stock on December 31, 1941, amounted to $5,280,640, or more than $4,000,000 over the current market value of practically all the assets of the company on March 31, 1942.

Slight Decline in Output Figures

Following a two-week pick-up, the amount of electrical energy distributed by the electric light and power industry showed a slight falling off for the week ended June 20. The figures show 3,433,711,000 kw.-hr. distributed, as compared with 3,463,528,000 kw.-hr. the week previous, according to E.E.I.

The week ended June 20 showed a gain of 11.1 percent over the corresponding week a year ago—a slight recession from the 11.7 gain registered in the previous week. The Southern states, the Rocky Mountain region and the Pacific Coast were up slightly, but New England, the Mid-Atlantic, the Central Industrial and the West Central regions all showed declines over the previous week's figures.

The decline in power output for the June 20 week is in keeping with the experience of the past two years when the figures for the third week in June receded slightly from earlier gains.

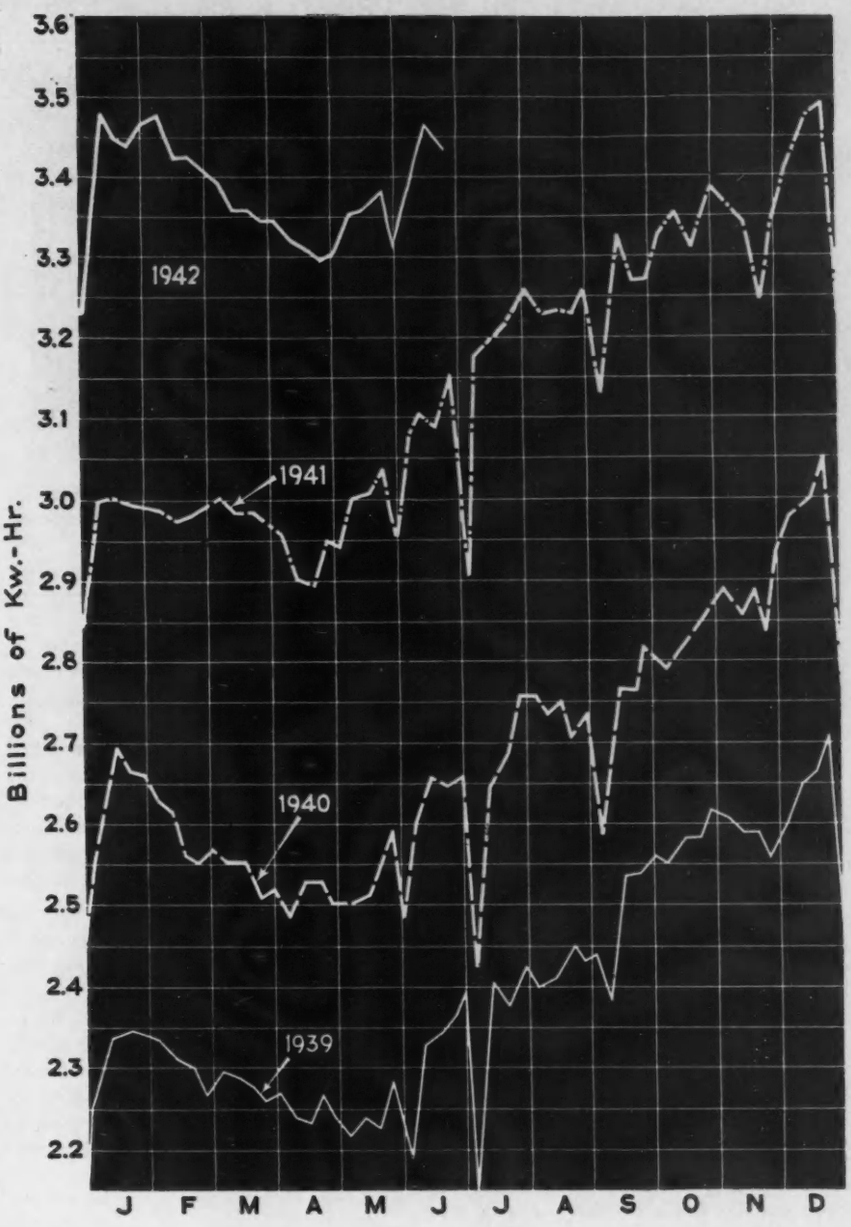
Weekly Output, Millions Kw.-Hr.

1942		1941		1940	
June 20	3,434	June 21	3,091	June 22	2,654
June 13	3,463	June 14	3,101	June 15	2,665
June 6	3,372	June 7	3,076	June 8	2,599
May 30	3,323	May 31	2,955	June 1	2,478
May 23	3,379	May 24	3,040	May 25	2,588
May 16	3,357	May 17	3,011	May 18	2,550
May 9	3,365	May 10	3,003	May 11	2,515
May 2	3,304	May 3	2,944	May 4	2,503
Apr. 25	3,273*	Apr. 26	2,950	Apr. 27	2,499
Apr. 18	3,308	Apr. 19	2,897	Apr. 20	2,529

Percent Change from Previous Year

	Week Ending		
	June 20	June 13	June 6
New England	+ 6.1	+ 6.8	+ 7.4
Mid-Atlantic	+ 6.8	+ 9.4	+ 5.8
Central Industrial	+ 7.5	+ 8.2	+ 7.3
West Central	+ 9.9	+11.7	+10.4
Southern States	+19.6	+18.8	+14.2
Rocky Mountain	+ 6.3	+ 5.7	+ 1.3
Pacific Coast	+17.8	+17.0	+17.6
Total United States	+11.1	+11.7	+ 9.6

* Revised figure.



Quebec Quarterly Output Up 27.3%

Continued expansion in production and sales of electric energy by the main public services in the Province of Quebec is shown in the report of the Public Service Board, covering the first quarter of the year.

Total generation of 5,124,970,877 kw.-hr. was 27.3 percent in excess of the first quarter of 1941; total sales in the first quarter were 23.5 percent above the corresponding period a year ago. Primary sales were up 32.5 percent and revenue from all sales in the province, amounting to $16,489,606, was 19.6 percent greater. Export sales of primary energy brought in 24.6 percent more revenue at $3,227,828.

Breakdown of primary energy sales shows a jump of 35.6 percent in industrial sales, an increase of 8.5 percent in domestic service, a rise of 5.1 percent in commercial service, 3.3 percent in municipal and street lighting and 3.3 percent in transport service. Wholesale sales to municipalities was off 1.6 percent.

•

OK's Sale of N. M. Utility to Municipal

The Public Service Commission of New Mexico has authorized the sale of the electric properties of the Lincoln County Utilities Co. to the municipality of Carrizozo and approved the proposal to issue $94,000 of revenue bonds to finance the transaction. The commission's action reverses an earlier ruling made on the grounds that the price to be paid was too high.

Amend Section 3203 of Electrical Code

A tentative interim amendment to Section 3203 of the 1940 edition of the National Electrical Code has been adopted by the National Fire Protection Association, according to Alvah Small, chairman.

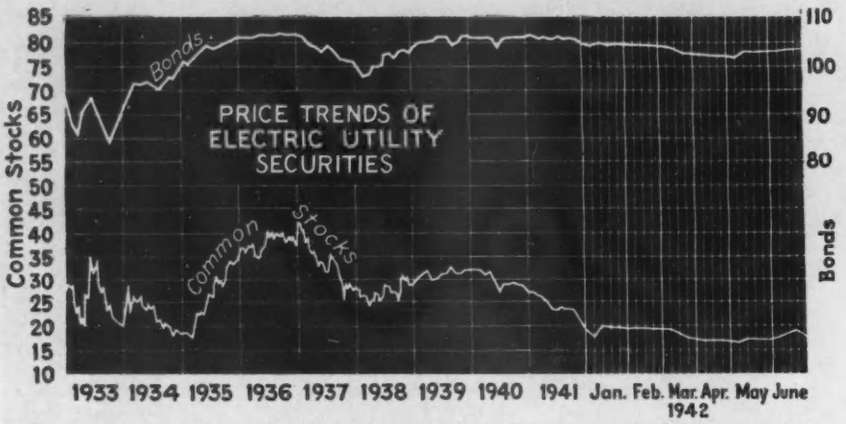
The amendment consists of insertion of a note to follow paragraph (a) Section 3203 and reads:

"War Emergency Note:

"Slow-burning weatherproof wire (Type SBW) may be used for open wiring on insulators in dry locations where the room temperature exceeds 60 C. (140 F.), but does not exceed 90 C. (194 F.)."

A number of other amendments recommended by committees are being voted upon.

Utility Stocks Decline; Bonds Hold Firm


PRICE TRENDS OF ELECTRIC UTILITY SECURITIES
Bonds
Common Stocks
Common Stocks
Bonds
85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10
110 100 90 80
1933 1934 1935 1936 1937 1938 1939 1940 1941 Jan. Feb. Mar. Apr. May June 1942

Reflecting the general market trend, electric light and power stocks lost ground during the past week. "Electrical World" index dropped to 18.6 from 18.9 the previous week; last year, 23.9. The bond index remained at 102.8; last year, 105.7

Utility Reports

	Net Income 1942	1941
*Arkansas Power & Light...	$2,013,271	$1,321,697
*California Electric Power and sub.	814,447	587,246
†Commonwealth & Southern and subs.	11,289,756	11,597,973
†Detroit Edison and subs..	10,623,297	11,365,294
‡Electric Power & Light and subs.	7,886,106	5,435,140
*Florida Power & Light....	1,464,920	2,853,925
*New Orleans Public Service	2,166,339	2,481,055
*Pennsylvania Power & Light	5,558,998	8,500,395
†Public Service of N. J. and subs.	16,369,474	24,036,082

*Twelve months ended April 30.
†Twelve months ended May 31.
‡Twelve months ended March 31.

FINANCIAL BRIEFS

ACQUISITION OF Pacific Power & Water Co., Vancouver, by West Canadian Hydro-Electric Corp. and elimination of a former holding company, Pacific Western Investment, were unanimously approved by all classes of bond and share holders concerned. Only new obligation incurred by West Canadian Hydro is an additional issue of $275,000 of 5 percent debentures, due 1966.

AMERICAN SUPERPOWER CORP. announces that 13,542 shares of its first preferred stock have been tendered by shareholders under the company's invitation for tenders, issued May 27, in exchange for 40,626 shares of United Corp. $3 cumulative preference stock. The offer, which expired on June 6, was on the basis of three shares of United preference for one share of American preferred. By the operation, outstanding first preferred of American has been reduced to 71,258 shares.

VIRGINIA PUBLIC SERVICE has elected to redeem, on August 1, all of its outstanding first mortgage and refunding 20-year, 5½ percent gold bonds, series A, due February 1, 1946; all its similar 5 percent, series B, due December 1, 1950, and all its similar 6 percent, series C, due March 1, 1952. In addition, holders of first mortgage gold bonds, series A, 5 percent, due 1956, of Southside Virginia Power Co., now merged with Virginia Public Service, are being notified that the latter company will redeem all of said bonds on July 1, 1942, at principal amount plus interest.

UTILITIES POWER & LIGHT OPERATING CORP. has filed a proposition with the SEC to dissolve and distribute its remaining assets, aggregating $10,000, to Ogden Corp., as a liquidating dividend. Derby Gas & Electric Corp., another Ogden Corp. subsidiary, proposes to SEC to acquire 48 shares of common stock of Derby Gas & Electric Corp. of Conn. for $1,016 in cash.

•

Utility Issues in May Total $16,150,000

New issues of electric light and power securities during the month of May amounted to $16,150,000, compared with $5,900,000 in April and $121,815,800 in May, 1941. Four utility companies participated in the new financing and of the four offerings issued three were placed privately.

May's new financing brought the total for the five-month period to $200,621,490, compared with $426,672,100 for the similar period of 1941.

•

Restrict Auxiliary Equipment Metals

The WPB power branch has set up, in the form of Limitation Order 154, machinery for establishing specifications or restrictions on use of scarce materials in the manufacture of auxiliary power, steam and water equipment.

First invocation of the order came simultaneously with its issuance, to curb use of nickel, tin and copper in the production of water meters. Similar restrictive orders applicable to electric and gas meters are in the making.

The restrictions on water meters prohibit use of stainless steel or nickel alloys, tin in coatings, or copper or copper alloys for the main casing, external bolts, nuts and washers, register boxes and lids, upper and lower plates and cages, and dials—everything except internal gears and workings.

It is intended that the term "auxiliary equipment" as used in the order shall apply to those items not covered by the Limitation Order 117 applicable to heavy equipment such as boilers and turbines.

New Issues of Electric Light and Power Securities in May

Name of Company	Amount (Par Value)	Offered to	Period (years)	Class	Purpose	Interest Rate	Price	Per Cent Yield
Indianapolis Power & Light Co.	$2,000,000	Placed privately...	28	1st mtge. bonds.....	Additions.....	3	101	2.94
Long Island Lighting Co.....	10,000,000	Placed privately...	14	Sinking fund debentures..	Refunding and to pay bank loans.....	3¾	100	3.75
Public Service Co. of Indiana, Inc.....	4,000,000	Public.....	30	1st mtge. bonds, series D..	Construction.....	3⅜	102¾	3.23
Vermont Utilities, Inc.....	150,000	Placed privately...	25	1st mtge. bonds, series A..	Payment of past due accounts, reimburse treasury for capital expenditures.....	4	....	....
Total.....	$16,150,000							

HOW DESIGN . . . CONSTRUCT OPERATE MAINTAIN

Trash Rack Welded in One-Half Time

By G. A. PEABODY
Superintendent of Mechanical Maintenance
New York Power & Light Corp., Albany

Recently, a new set of trash racks was made by an all-welded method of construction and installed at one of our power houses. These racks, we believe, completely overcome the many bad features of the rack built with bolts and spacers. It will have a much longer life, will never become loose due to heavy stresses and strains, and can be built in less than one-half the time and cost of the original bolted rack. We also expect it to last until the rack iron is deteriorated beyond further practical use.

A jig was made in order to simplify the fabrication of these racks, as there were several to be made of the same length, spacing and total width. In addition to holding the bars to the exact dimensions required and squaring up the rack the jig was made to revolve 180 deg. in either direction.

TRASH RACK in process of construction

For this particular job each rack section consisted of thirteen 3-in. bars, $\frac{3}{8}$ in. thick, 15 ft. long, spaced 3 in. apart. In place of the bolts and spacers originally used to hold the sections together flat iron bars were used, 4 in. wide and $\frac{1}{2}$ in. thick, with notches $1\frac{1}{2}$ in. deep cut into one edge at the required spacing. One end of each spacing bar was allowed to extend 3 in. beyond the outside rack bar to keep the completed rack sections spaced the same when finally assembled as a unit. The $1\frac{1}{2}$-in. notch in the crossbar, with the $2\frac{1}{2}$-in. solid section extending on the back side, makes the completed rack very rigid and allows $1\frac{1}{2}$ in. clear space on the front or upstream side for raking.

The process of assembling and welding one rack is as follows: The thirteen 3-in. bars are placed with each end in a jig. The two jigs, consisting of notched bars of the required spacing, are supported on bearings in the center. A lever arm is provided, arranged so that the entire assembly may be revolved 180 deg. in either direction and secured in any position.

A complete set of bars is first assembled in a horizontal position; the required number of crossbars are then placed in position from the top side, each individual bar is then pulled to the bottom of the slot by means of a J-bolt clamp and tacked by use of the electric arc between the edges of the long bar and the cross bar. After all bars are secured in each slot in this manner the whole rack assembly is revolved by means of the revolving jig, so that the rack is in a vertical lengthwise position. One complete side of every slot is then welded, each weld being made in an entirely horizontal position.

COMPLETED trash rack

After one complete side is welded the entire rack is revolved 180 deg. and the other complete side is welded. Thus all welds are made in a horizontal position, which allows for a much faster and better weld and a completely watertight joint in every case. The completed rack is finally removed from the jig and a slight bend in the crossbars, caused by heat, straightened. After the rack is painted it is ready for use.

Construction of one rack by this all-welded method required two days for one man, which is less than one-half the time to make one rack by the bolted method.

•

More Data on Steel Pipe Conductors

Since publication of the article "Evaluate Steel Pipe as A.C. Conductor," by Stanley C. Killiam in ELECTRICAL WORLD of April 18, 1942, several requests have been received for additional data on carrying capacity of steel pipe at higher temperatures than the 30 deg. C. rise stipulated. Further tests have been

Current-Carrying Capacities of Standard Steel Pipe
Amperes at 45 and 60 Deg. C. Rise, 60 Cycles

Pipe Size	UNSLOTTED PIPE				SLOTTED PIPE			
	Indoor		Outdoor		Indoor		Outdoor	
	45°C. Rise	60°C. Rise	45°C. Rise	60°C. Rise	45°C. Rise	60°C. Rise	45°C. Rise	60°C. Rise
¾ in.	140	170	185	230	215	260	285	355
1 in.	165	205	215	260	240	295	315	385
1¼ in.	195	240	250	305	275	335	355	435
1½ in.	230	280	285	355	315	385	395	485
2 in.	275	345	340	415	375	460	455	560
2½ in.	330	410	400	490	435	535	520	640
3 in.	385	475	460	565	495	610	590	720
3½ in.	440	540	520	640	555	685	660	810
4 in.	495	605	580	715	620	760	735	900

made by the author at 45 and 60 deg. C. rise, 60 cycles, and the values appear in the table above.

At these higher temperatures the author cautions that care should be taken to prevent heat transfer from the pipes to other equipment rated at 30 deg. C. maximum rise. For example, it would be poor practice to connect steel pipe with 60 deg. C. rise directly to a switch lug. Enough heat would transfer to raise switch above 30 deg. rise. One method of overcoming this objection would be to use an over-rated copper section between steel pipe and switch. Brazed, welded or soldered joints between steel and copper are desirable to prevent oxidation at elevated temperatures.

•

Fuses Set at Angle Are Safer to Service

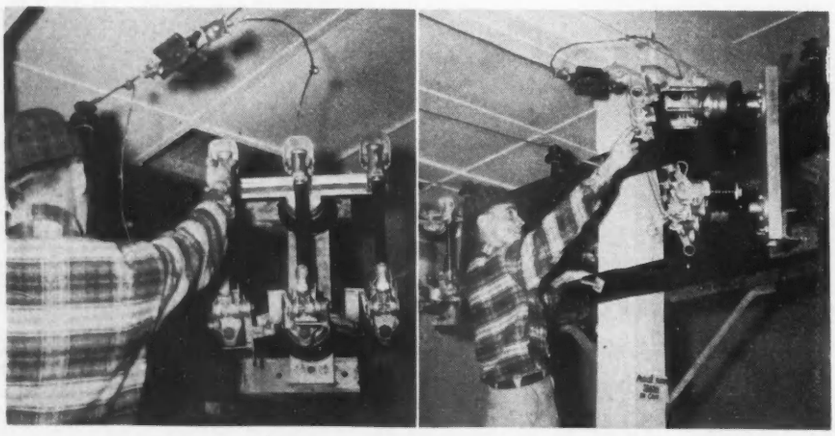
For reasons of safety to linemen, repeater fuses on 4-kv., three-phase construction on the Oklahoma Gas & Electric Company system are now set at 45 deg. to the face of the crossarm, with two of the three sets of fuses on the face and the third on the back of the pole. Arrangement and resulting improved clearances are shown in the accompanying illustration.

The bracket to which each fuse assembly is bolted consists of an 8-in. and 11-in. length of 4-in. channel (width of arm) welded together at the desired angle.

Formerly all three sets of fuses were bolted flat to one side of a double arm. It was found somewhat hazardous for linemen, in changing out fuses, to stand facing the center fuse assembly and reach across the cartridges of either end assembly to close the outboard fuse of that group. Clearances were also a problem.

With the center fuse assembly moved to the back of the pole and all assemblies set at 45 deg. to the pole both clearances and safety considerations were satisfied.

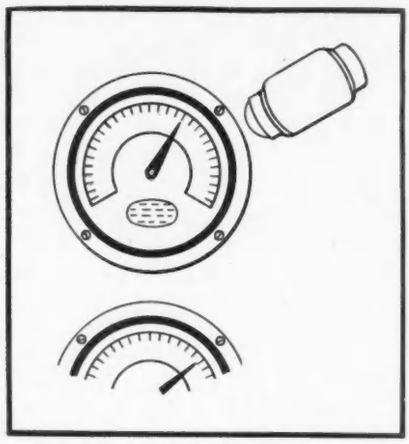
In arriving at the best angle several were tried, including 30, 67½ and 45. Linemen generally agreed that 45 was the most convenient.



REPEATER FUSES set at 45 deg. to crossarm are easy and safe to operate.
(These pictures were posed on an unenergized "study" set-up. Normally a lineman would not pull fuses with bare hands.—Editors.)

Bed Lamps for Power Plant Blackout

In an electric utility power plant there are certain essential instruments whose indications must be seen, blackout or no blackout; for instance, oil pressure in main turbine bearings. In England the practice is to illuminate the scales of these instruments by low-candle-power, shaded lamps, usually blue. A typically American improvement on this practice is to be seen in a Southern power station. Bracketed on instrument panels, with their beams trained on the scales of



ESSENTIAL instruments lighted by bed lamps

the essential indicators, are ordinary bed-reading lamps of the bulls-eye type. The lamps contain 2-watt bulbs and are all connected in a single circuit which is a component of the blackout lighting system. Some forms of these bed lamps have a ring of ventilating holes which allow a certain amount of light leakage. These holes can safely be closed when a 2-watt bulb is used.

•

Added Protection for Condensers

To make sure that no damage to the windings would result through the application of full voltage before the synchronous condensers had reached synchronous or near-synchronous speed, additional protective equipment was installed at two substations of a Midwestern utility.

One of these machines is rated at 15,000 kva., 13.8 kv., while the other is a 7,500-kva., 4,150-volt machine. The only relays on hand were type

MEMO TO POWER COMPANIES

Because of your vital interest in the electrical phases of today's many new construction projects, you'll probably be interested in this information General Electric is making available to industrials, consulting engineers, and similar interested groups.

4 SIMPLE STEPS to Save

★Months of Time *and* ★Tons of Vital Materials

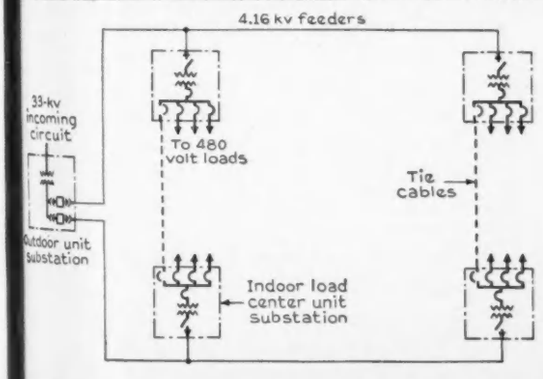
—in Getting Electric Power to New Production Machines

1. Decide on a modern load-center distribution system using load-center unit substations.

2. Make a simple, one-line electrical layout of your proposed plant.

3. Specify standard equipment; standardization means you get better equipment more quickly and at lower cost.

4. Order your electric equipment as soon as possible so that it will be available for immediate installation when construction has progressed far enough.



A typical one-line diagram of a load-center distribution system, with power being distributed at high voltage (2.4 to 13.2 kv) to unit substations located near the centers of electrical load areas—eliminating long, heavy, low-voltage feeders from a distant large substation. Thus, you save tons of copper, and the performance of motors, lamps, etc., is improved because of the reduction in voltage drop.

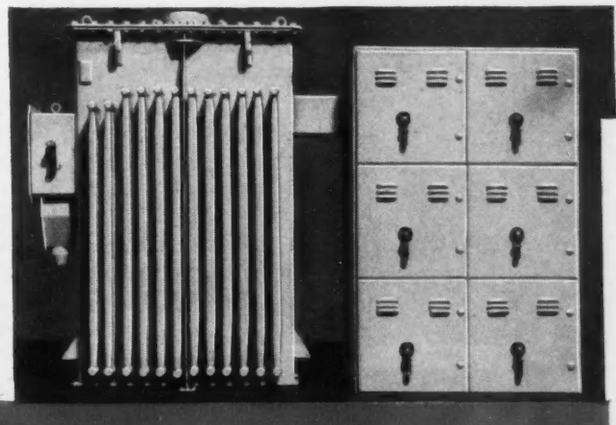
BY following these steps in General Electric's plan to provide standard, load-center distribution equipment in the shortest time possible, you can save from *one to six months* of the time ordinarily required. You eliminate hours and hours at the drawing board, and long, drawn-out correspondence.

What's more, load-center distribution saves tons of steel, copper, and other vital materials; installation time is quicker, and service better.

To help you get your equipment specified, purchased, and installed under this new, short-time plan, a new "handy guide" is just coming off the press. Mail the coupon for your copy today.

General Electric, Schenectady, N. Y.

General Electric and its employees are proud of the Navy award of Excellence made to its Erie Works for the manufacture of naval ordnance.



Factory-assembled, safety-metal-enclosed unit substations are quickly and easily installed right at load centers —without expensive vault construction, thanks to Pyranol. Simply slide the completely assembled sections into position and connect to the primary and secondary cables.

GENERAL ELECTRIC

General Electric Co., Sec. A 302-11
Schenectady, N. Y.

I understand your new handy guide to "Quickly Installed Electric Power Systems" (GED-1006) explains in detail the steps to follow in order to get power to new production machinery in one to six months less time. Please send me a copy.

Name.....

Company.....

Address.....

City..... **State**.....

302-11-170E

SV voltage relays, for use on 60-cycle, 120-volt circuit, and since these had to be operated from pilot exciter voltage it was necessary to insert resistors in the circuit to limit current flow.

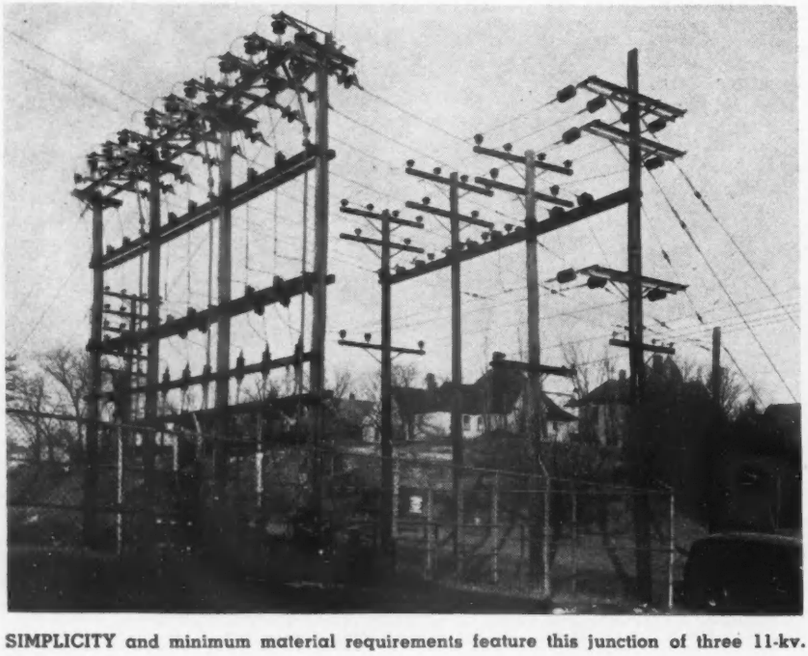
The operating coil of the relay was connected directly across the pilot exciter of the condenser, while the circuit-closing contacts were connected in series with control switch contacts operating the closing relay of the running oil circuit breaker. Relays are calibrated to pick up at 105 volts d.c., a voltage that does not maintain on the pilot exciters until the condensers have reached approximately 90 percent speed.

•

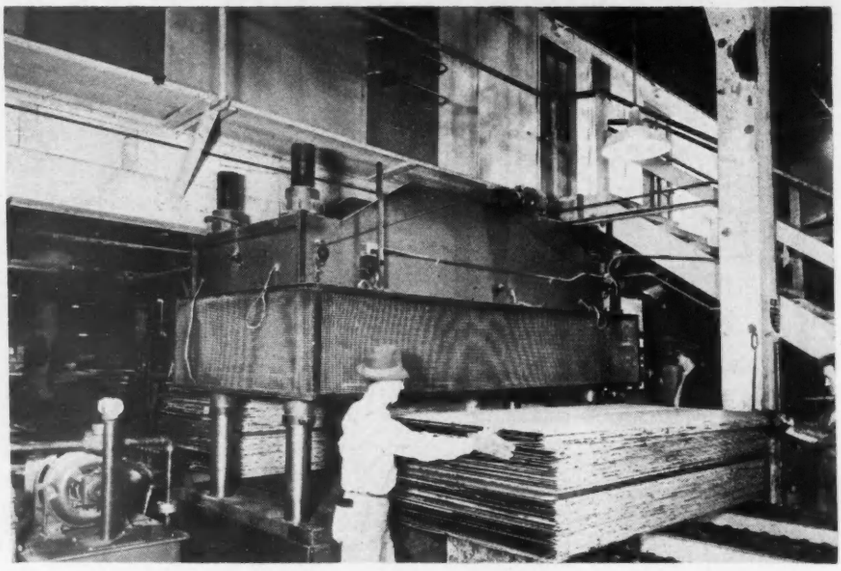
Material Economy at Three-Line Junction

Economy in use of material is notable in this 11-kv. junction terminal in an Eastern war industry area where three overhead circuits connect with three underground cables. Only eight wooden poles were required to dead-end the nine phase wires coming in from above, provide horizontal cross-connections to three three-phase manually controlled air-break switches, afford space for drop leads and drip loops terminating in cable bushings about 12 ft. above ground, and taps with disconnecting switches leading to three lightning arrester banks on concrete mats in the center of the wire-fenced inclosure. Three-phase pot heads simplify the final cable connections.

Steel angle-irons were used only at overhead circuit dead-ends and to support the air-break switches, other horizontal members of the structure being of wood. All circuits are run straight to their destinations without returning in direction, and insulated guy wires strengthen the poles without the need of complicated cross bracing. Both from first cost and maintenance standpoints the construction was designed for simplicity and minimum material requirements.



SIMPLICITY and minimum material requirements feature this junction of three 11-kv. overhead circuits



LAYING UP a bundle of freshly glued panels for pressing. Metal-plated caul board in middle of bundle becomes positive element of a condenser. Bed and top plates of press comprise negative element. Wet plywood acts as the dielectric and is dried by internal heat generated by high-frequency current

High-Frequency Heat Used to Make Plywood

High-frequency current at approximately 2,000,000 cycles per second is now being applied to the manufacture of plywood. The application is found in two new presses recently installed in the plant of the Albany Plylock Division of the M & M Wood Working Company, Albany, Ore. The principle employed is that of a condenser charged with high-frequency energy, producing heat in the dielectric which is the plywood itself. This heat sets the glue in a comparatively short time, thus speeding up plywood manufacture in the plant, with resulting economy.

In the new high-frequency presses the panels, with the wet glue between the plies, are stacked upon the bed of the press to a depth of 9 in. Then a metal-plated caul board is inserted, above which is another 9-in. stack. This caul board is the positive plate of a condenser, while the metallic top and bottom members of the press constitute the negative plates. To these positive and negative plates the high-frequency current is applied, the wet plywood acting as the dielectric.

With this condenser the desired effect is the reverse of electric charge accumulation. Flow of the current through the dielectric distorts the molecules repeatedly and at these high frequencies produces molecular friction, releasing heat throughout the en-

a Check List for Wartime Transformer Buyers

Get these 5 Pyranol features and you are sure of reliable service

1. **High emergency-overload capacity.** The heat storage capacity of Pyranol makes Pyranol transformers ideal for emergency overloads.

2. **Stamina to withstand voltage surges.** High dielectric strength (inherent in liquid-filled transformers) is an extra safeguard against damage from voltage surges due to lightning or switching operations.

3. **Noninflammability.** You can't burn Pyranol. No Pyranol transformer has burned, or contributed to a fire. This record, covering 10 years of operating experience, fully justifies the recognition accorded Pyranol transformers by the National Electrical Code.

4. **Virtual freedom from maintenance.** The efficiency and life of Pyranol transformers do not depend on frequent cleanings and other attention. Pyranol is nonoxidizing and nonsludging. Under normal operating conditions it will maintain its insulating properties through years of service.

5. **Protection against moisture and dirt.** The pressure-tight steel tank protects vital transformer parts against moisture, dirt, dust, abrasives, and other enemies of transformer reliability.

TRANSFORMER reliability is a big factor in continuity of power supply, and that's essential to maximum war production. Pyranol units have all the features—*plus*—that have made liquid-filled transformers the most nearly trouble-free electric apparatus in service today.

Save Vital Copper, Too

An actual example of savings: One new war plant saved 30,000 pounds of copper (because of shorter runs of heavy secondary conductor) by installing Pyranol transformers indoors at load centers.

Moreover, by locating transformers near the load, you get better voltage regulation and lower line losses.

For complete information on Pyranol transformers for your requirements, consult your G-E representative. Or, write General Electric, Schenectady, N. Y.

333-kva Pyranol transformer, incorporating Spirakore design. Rated 60 cycles, 2400/4160Y volts to 240/480 volts.

General Electric and its employees are proud of the Navy award of Excellence made to its Erie Works for the manufacture of naval ordnance.

GENERAL ELECTRIC

402-43-5100

tire mass of the dielectric. This heat, evenly distributed, brings about the setting of the glue in a few minutes.

Amount of power required is 600 kw., evenly divided between the two presses, it being generated normally by the company's steam plant. Conversion losses reduce this to approximately 400 kw. at the points of actual application.

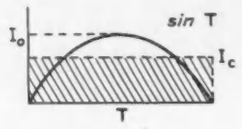
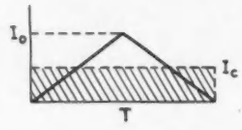
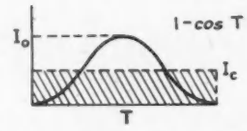
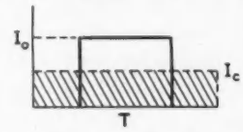
The original 4,400-volt alternating current is stepped up by transformers to 15,000 volts and converted to direct current by means of mercury-arc rectifiers. This is then converted to radio-frequency current at approximately 2,000,000 cycles by means of mercury-vapor amplifier tubes of large capacity. The tubes and transformer equipment are located in an inclosure on a balcony. A uniform flow of power as applied to the electrodes is maintained by a series of electrical controls responsive to the electrical capacity of the plywood bundle.

The temperatures required in the plywood bundle are ordinarily between 160 and 180 deg. F., although sometimes reaching 300 deg., depending upon the type of glue used. However, these temperatures are always well under the maximum that the wood can stand without charring, surface checking, or blistering by steam pockets.

The metal-plated cauls constituting the positive electrodes in the two presses are each 4 ft. wide, one being 10 ft. long and the other 8 ft. About 40 plywood panels of average thickness are contained in a bundle for pressing. But much thicker panels may now be made, 5, 6 and even 9 in., and still require no longer time in the press. In contrast to this the limit in thickness, using the conventional hot press, is about 1 in. Narrower and shorter bundles can also be handled by the high-frequency press without appreciable loss in production capacity, since the rate of heating is nearly in direct proportion to the volume of the plywood bundle.

This application is one that was worked out largely by Paul D. Zottu, electrical and radio engineer, Thermal Engineering Corporation, Richmond, Va. Observing the results of Zottu's experiments, the M & M Company, of which Michael Pasquier is chief engineer, arranged to have the principle applied to plywood manufacture. The two presses have been in operation since late 1941.

Reduce System Vars to Trim Losses

Case	Load Pattern	Chart	Optimum Value of I_c	Per Unit Loss Values	
				Without I_c	With I_c
I	Half-sine		$\frac{2}{\pi} I_o$	1.0	0.202
II	Triangular		$\frac{I_o}{2}$	1.0	0.25
III	Displaced cosine		$\frac{I_o}{2}$	1.0	0.333
IV	Rectangular		$\frac{I_o}{2}$	1.0	0.5

By J. W. BUTLER

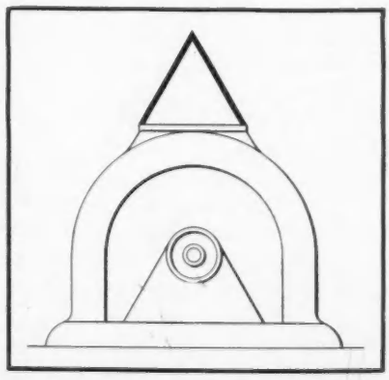
Central Station Engineering Department, General Electric Company, Schenectady, N. Y.

Since I^2R losses due to reactive component (I_q) of power current are quite independent of those due to the power component (I_p) of current (*i.e.*, Total loss $= I_p^2R + I_q^2R$), loss reduction through reactive current reduction can be computed without any knowledge at all of power factor, load factor, etc., it is only necessary to know the system kilovar requirement to determine the optimum amount of unswitched capacitors to effect maximum loss reduction.

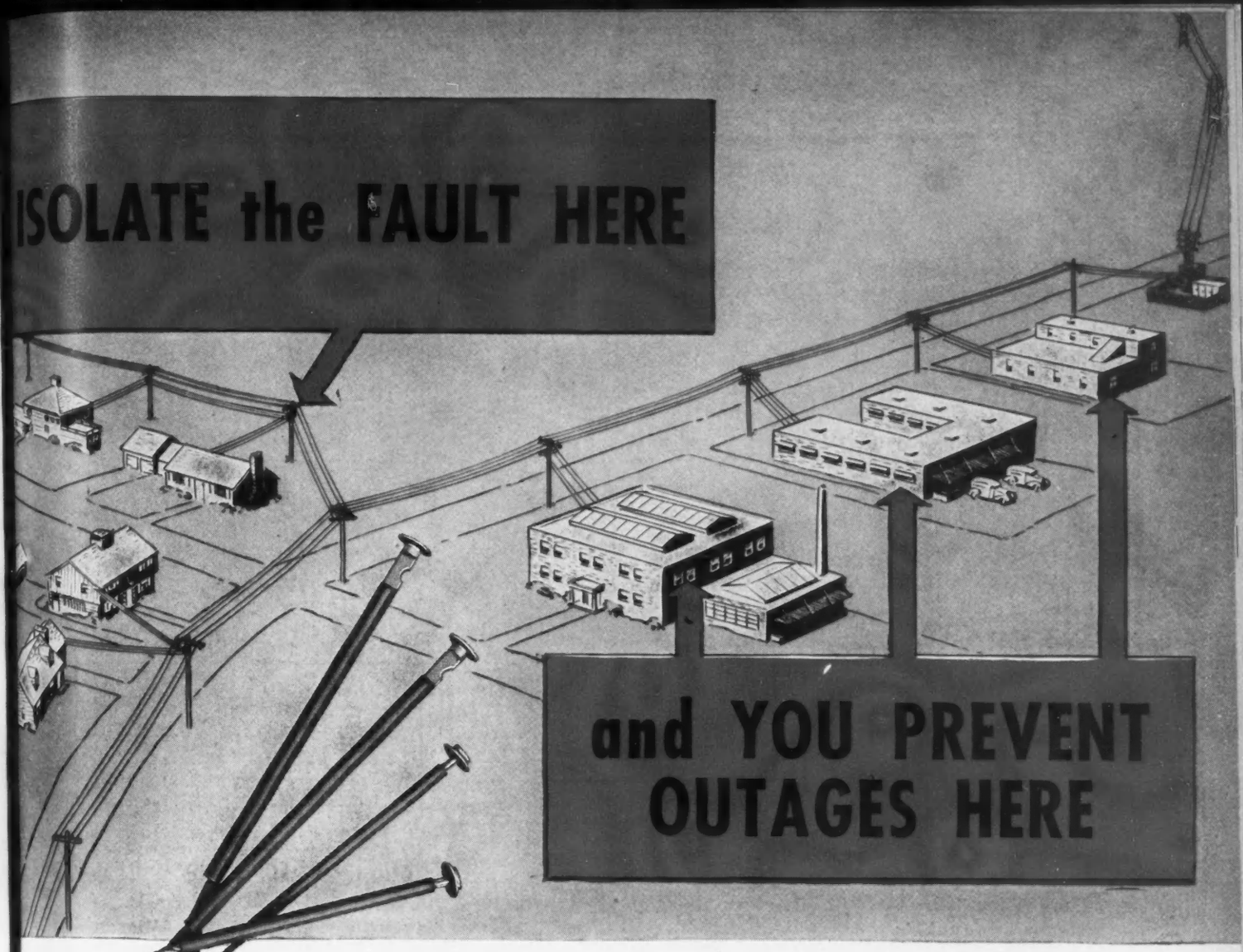
Any load pattern is likely to have a base kilovar requirement, representing the minimum value, which can be immediately supplied by unswitched capacitors and its loss removed from the circuit. Optimum reduction of the variable portion of the various types of kilovar pattern with unswitched capacitors will result from the amounts of capacitor kilovars indicated in the accompanying illustration.

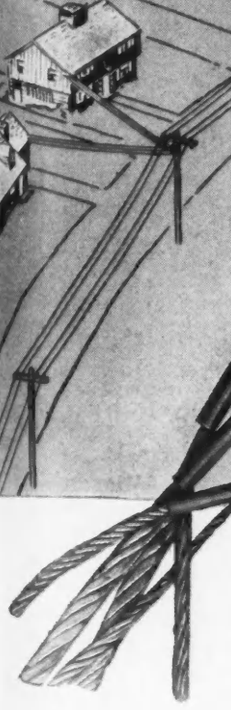
Generator Protection Against Incendiaries

In an Atlantic Coast power station it happens that the row of generators is situated directly under a long skylight. The generators are of the type with a large opening in the top of the housing to allow the exit of cooling air. It seemed that if an incendiary bomb dropped through the skylight it would inevitably fall right into one of those generator air openings—the worst being almost always sure to happen. But the worst was quite easy to guard against, as is shown in the accompanying sketch. Over each opening there was installed a sharply pitched roof of stout steel screen. Now if an incendiary bomb tries to drop into a generator it will be deflected to the floor, where it can be dealt with in the fashion in such case made and provided.

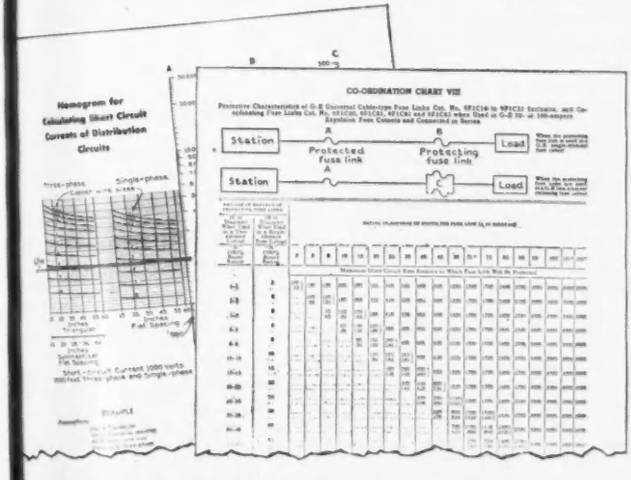


SCREEN ROOF protects generator air opening





Complete Line of Universal Links—Our new 125-, 150-, and 200-amp universal fuse links, now available, extend the G-E standard line to include fuse links up to 200 amperes. Co-ordinating links, rated 51, 52, 101, and 102 amp, make possible extra flexibility and economy.



Co-ordinating Tools Free for the Asking—For calculating short-circuit currents quickly and easily, ask for copies of Nomogram GEA-2313 from your G-E office. For guidance in selecting the proper fuse links to co-ordinate your system, request copies of our protective-characteristic charts, Publication GES-2624. General Electric Company, Schenectady, N. Y.

YOU CAN DO IT BY CO-ORDINATION WITH G-E UNIVERSAL FUSE LINKS

THE accuracy of G-E universal cable-type fuse links enables you to co-ordinate your overcurrent protection in order that every fault will be isolated by the first cutout toward the source of power. This reduces the number of consumers deprived of power. The duration of the outage is lessened because, in order to locate the fault, the lineman needs to patrol only that section of the line that is isolated by the cutout. For these reasons, the total consumer-minutes-outage is only a fraction of that on unco-ordinated circuits.

G-E Standards of Accuracy

To make sure that the G-E cutouts on your circuits will always give dependable co-ordination by operating in the proper sequence, all materials that go into G-E universal cable-type fuse links are checked to see that they comply with rigid specifications. Tolerances of the fusible elements are held to a few thousandths of an inch. The finished links are compared with standard resistances and must check within a few thousandths of an ohm.

General Electric and its employees are proud of the Navy award of Excellence made to its Erie Works for the manufacture of naval ordnance

GENERAL ELECTRIC

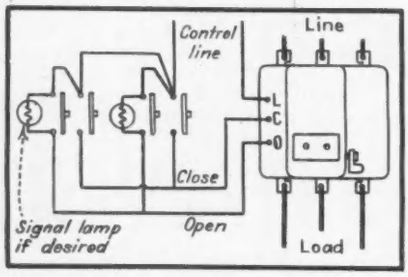
406-11-5254

INDUSTRIAL PLANT BLACKOUT CONTROL

From a central point industrial areas can be controlled for blackout by seven typical methods suggested by Automatic Switch Company, New York, N. Y. Normally open switches (open when de-energized) must be used so that upon coil or control failure the switches will fail "safe" for blackout conditions and automatically turn off the lights.

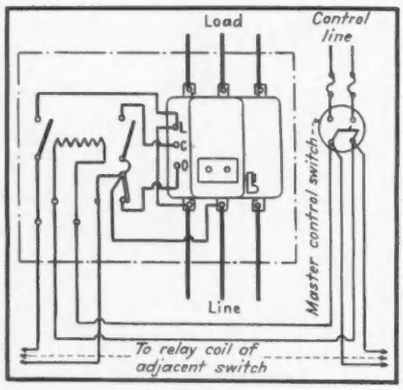
This, of course, is the opposite of peace-time control.

METHOD 1



METHOD 1 utilizes three-wire control, mechanically held switches. These switches in capacities up to 200 amp. at 250 volts can be operated at a distance of 3,200 ft. with No. 10 wire for 220-volt control circuit. For greater distances it is more economical to use control relays.

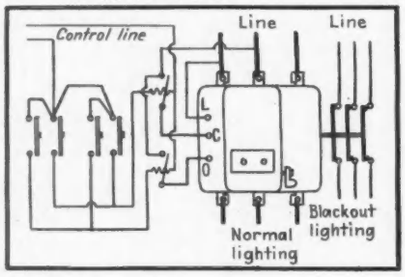
METHOD 2



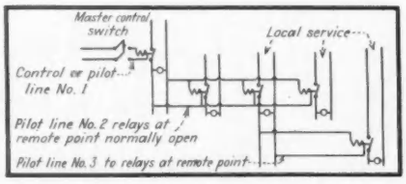
METHOD 2 is similar to Method 1, with addition of two-wire control relays. Low-wattage relay coils may be connected in multiple or cascade, depending on the pilot-wire size, length of run and number of controlled locations. The main switches may be built into lighting panels.

METHOD 3 is similar to Methods 1 or 2 with additional 30-amp. contacts on the single-operating mechanism and forming a double-throw switch. These contacts turn on low-intensity blackout light when the main lights are turned off. Relays may be used as in Method 2 or in pairs, each energized momentarily.

METHOD 3

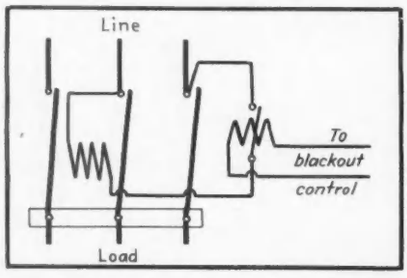


METHOD 4


Master control switch
Local service
Control or pilot line No. 1
Pilot line No. 2 relays at remote point normally open
Pilot line No. 3 to relays at remote point

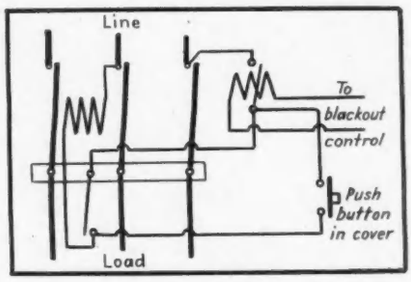
METHOD 4 utilizes two-wire control, magnetically held, 1- 2- or 3-pole contactors connected in multiple or in cascade. This method is applicable for many loads of a few kilowatts each scattered over wide areas, provided the control wires do not become prohibitive in size.

METHOD 5



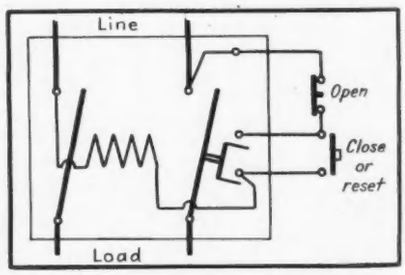
METHOD 5 is similar to Method 4 with additional control relays. Low control current permits small control wires for the same length of run.

METHOD 6



METHOD 6 utilizes three-wire control contactors with additional "blackout" relays of two-wire control. Opening the relay control line opens the contactors, which can be reset only by local push-buttons when the relays are reclosed after the all-clear signal. Local resetting of each contactor is required, whereas in Methods 4 and 5 complete control is available from a central location.

METHOD 7



METHOD 7 utilizes three-wire control contactors which open on no voltage on momentary opening of the main circuit breaker. Although pilot wires are eliminated, this method causes interruption of communications, emergency lighting, and requires restarting of all machinery. After circuit breaker reclosure contactors may be reset regardless of the all-clear signal, thus permitting sabotage or errors.

A WHOLE MONTH'S OPERATION AT ONE GLANCE

That's Why You'll Like the One-inch-per-day Chart Speed of This Instrument

THE low chart speed of our new portable recorder gives you a 30-day record (of current or voltage) on a 30-inch chart. This makes it easy to stretch out the entire chart on your desk and see, at one glance, the spread of current or voltage, as well as the duration of maximum and minimum values.

This eliminates the annoyance of having to handle 60 ft of chart (a month's record at the minimum chart speed previously available).

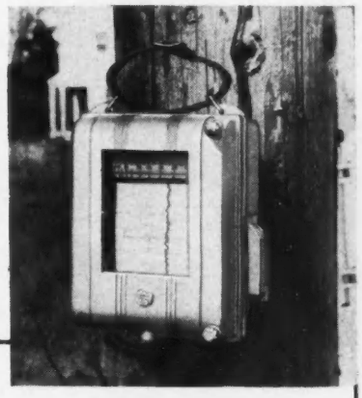
You can obtain this Type CF-1 recorder in both ammeters and voltmeters. Place your order today, and see for yourself how this instrument will simplify the work of analyzing your surveys. General Electric, Schenectady, N. Y.

IT'S INKLESS

1. Requires no attention during a month's operation.

2. No "lost" records, for there's no pen to clog and no ink to freeze or evaporate.

3. Records accurately in temperatures from −10 F to 120 F.



WHERE IT WILL PAY DIVIDENDS

1. For voltage surveys where constant vigilance is necessary in order to detect and correct trouble—thus assuring better service and protecting your revenue.

2. For load surveys of power-station equipment to be sure machines can carry their loads—thus protecting against burnouts.

3. For continuous checks of important transformers—thus guarding against burnouts.

HEADQUARTERS FOR ELECTRICAL MEASUREMENT

GENERAL ELECTRIC

602-30-6200

Gets Essential Data From Few Instruments

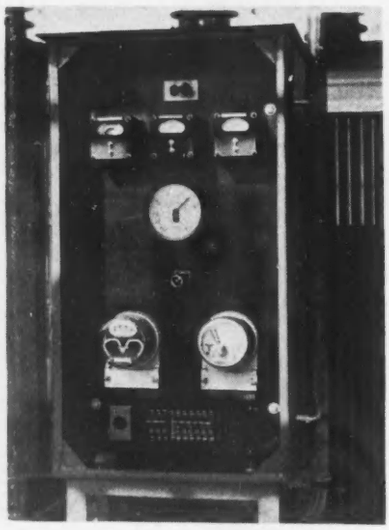
With production of electric meters and instruments for commercial purposes limited by war-time conditions it is more than ever important to use the least possible number of instruments at substations that will furnish the data for most effective operation of load areas served from distribution substations. Accompanying illustrations show an efficient arrangement of instruments that is being used as a distribution substation of Missouri Valley utility, to supply operating information on:

1. Voltage at distribution bus.
2. Kilowatt demand through transformers.
3. Kilowatt-hour output.
4. Current flowing through each transformer or phase, both instantaneous values and average values for a time interval.

At this particular substation transmission voltage is 33 kv., distribution 12 kv. and transformer capacity 1,500 kva.

Instruments are assembled on a panel 24 in. wide and 48 in. high. They consist of a voltmeter with switch, a thermally lagged watt demand meter, a kw.-hr. meter and three ammeters containing both instantaneous scales and thermally lagged scales. The latter are calibrated to read percent of load on either the transformer or phase. Both transformer and phase number are marked on the instrument. Thus the operator has before him indication of phase loading and phase balance, both at the moment and at the time of maximum demand. From this he can correct inequality in the division of single-phase load between the three phases in the area served.

VITAL ELEMENT of efficient substation metering is instrument unit which gives either phase or transformer loading at the moment and at time of maximum demand.



MOST operating data for the least number of instruments is obtained with this efficient distribution substation metering set-up.

The metering assembly devised by H. E. Hoadley, distribution engineer, is housed in a weathertight cabinet, with doors on two sides. One door gives access to the front or instrument side; the other door gives access to the rear of the panel and the charging equipment for an 18-volt tripping battery below the panel housing.

This equipment and method of assembly comprise a unit which may be included as part of any distribution substation where the transformer, breakers and other equipment are separate. Cost is but a small percentage of substation cost and in most cases appears well justified.

•

Cautions on Use of Soft-Soldered Joints

Before specifying soldered fittings for new or unusual applications, careful consideration should be given to possible deterioration of the solder bond, especially if the service involves elevated temperatures. This is the advice of W. H. Swanger of the National Bureau of Standards and A. R. Maupin of the Copper & Brass Research Association, who have been studying the use of soft-soldered joints in copper tubing.

While there is abundant evidence that for ordinary service at room temperature the possibility of deterioration of the joint can be disregarded, if service conditions are such that prolonged periods at elevated temperatures are involved, some deterioration of the bond of the soldered joint may occur.

The study in question was carried out on sleeve joints in copper tubing made with a variety of solders of tin-base and the lead-base types. When a joint made with a tin-bearing solder is held for several thousand hours at a moderately elevated temperature, say 250 deg. F., alloying occurs between the copper base and tin which diffuses from the solder. The tendency is to form an alloy bonding layer which is hard and brittle. This tendency was noted for all solders containing tin even in an amount as low as 5 percent. As a result, the joint loses strength and some of its other desirable characteristics. Joints made with lead alloys containing no tin showed no deterioration.

Accurate measurements of the hardness of the alloy constituent which formed were made possible by the use of a new micro-indentation hardness device recently developed at the National Bureau of Standards.

•

Welded Seal Rings Cost 60% Less

By depositing a seal ring of weld metal on top of the base of an old band without removing it from a hydraulic turbine wheel plant engineers of the Turlock Irrigation District in California "poured" a new band right in place without the need for machining the inside surface. This operation reduced the replacement cost by 60 percent.

Ordinarily the seal rings on hydraulic turbines in electric power plants are made up of bands of iron and then shrunk on the turbine wheel just like an iron wagon wheel. The machining of the inside surface of this iron band is slow and difficult.

For instance, the band on the turbine was only a little more than $\frac{1}{2}$ in. thick and 5 ft. in diameter. It had to be machine finished to a pin-gage diameter of about minus 0.062. Setting up this band on a boring mill, clamping it at sufficient places to keep it rigid while turning, and then doing the turning job—all operations take

New, Improved
PHOTOELECTRIC
WATTHOUR-METER TESTER
for easy, low-cost testing
IMPROVEMENTS
1. Entirely new electric circuit—so arranged that the equipment responds to rate of change in light intensity, and is not affected by normal room illumination or any amount of stray light falling on the photocell.
2. No adjustments—grid-bias adjustment eliminated.
3. Two separate revolution selectors—one for light load, the other for full load.
4. Transfer switch—for changing from one revolution selector to the other.
5. Built-in LIGHT-DARK switch—so meters can be tested by shining light through the anticreep holes of the meter disk or by reflecting light from the edge of the disk.

How It Works

THIS automatic equipment for testing watthour meters makes use of the "electric eye." A light beam and relays count the revolutions of the meter under test, and start and stop the rotating standard.

Advantages of Photoelectric Testing

This method of testing provides two fundamental advantages—improved accuracy and saving in time—which reduce the cost of testing.

The timing error is negligible; hence, long runs are unnecessary. This permits a 50-per-cent reduction in running time as compared with the running time of the old hand-switch methods, where the timing accuracy is dependent on the operator's skill.

Additional savings can frequently be made by planning the entire test procedure. How this can be done, how to test meters that do not have anti-creep holes in the disk, how the equipment can be put to many other uses—all this is explained in Bulletin GEA-3348. Ask the nearest G-E office for a copy.

Let this tester save time that is so essential now when experienced operators are going into the services or are being transferred to other jobs. *General Electric, Schenectady, N. Y.*

General Electric and its employees are proud of the Navy award of Excellence made to its Erie Works for the manufacture of naval ordnance.

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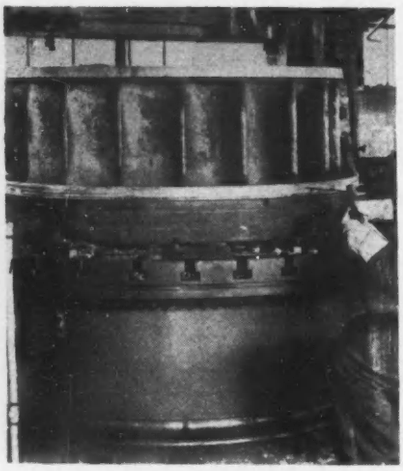


Photo courtesy Hobart Brothers Co.

DEPOSITED seal ring of weld metal on turbine runners which is clamped to bed of boring mill

time and cost a considerable sum of money.

Savings by the arc welding method are shown by the following comparisons of costs, furnished by Hobart Brothers Company, Troy, Ohio:

Cost of a new iron band and machining:	
15½ ft.—1 x 2-in. iron bar	$4.50
Labor and machining	56.25
Total	$60.75
Cost for arc welded seal ring:	
Electrodes	$2.50
Welding and overhead	18.00
Total	$20.50
Savings by arc welding	$40.25

According to L. H. Parker, engineer at the Turlock Irrigation District, where this job was performed, the welded rings fit perfectly and are much tighter than the old ones due to the natural weld metals contraction.

•

Locating Faults in Pipe-Type SMD Cable

With the installation of 120-kv. pipe-type gas-filled cable, the Detroit Edison Company has devised methods for locating gas leaks and cable faults. The criteria for selection of this type of cable are recorded in the article on page 44 of this issue.

In the case of all exposed parts of the pipe system discovery of leaks should be readily effected by ear or by the formation of bubbles in a soap solution applied to the concerned parts. Where leaks are in the buried pipe, several proposed methods appear to hold promise, but cannot be revealed until proved.

For locating faults in the cable the proposed procedure is founded on the use of three methods: (1) A bridge measurement at the station, supplemented by either, or both; an audible signal, consisting of sound produced by the discharge of a high-voltage condenser picked up by a stethoscope device; (2) a pipe-drop method in which rectified alternating current is applied to the pipe and faulty conductor from a Thyratron tube capable of delivering 8 to 10 amp. at 5,000 volts, and (3) millivolt drop readings taken in the manholes over 50 ft. of pipe by means of the leads provided for stray current and corrosion measurements.

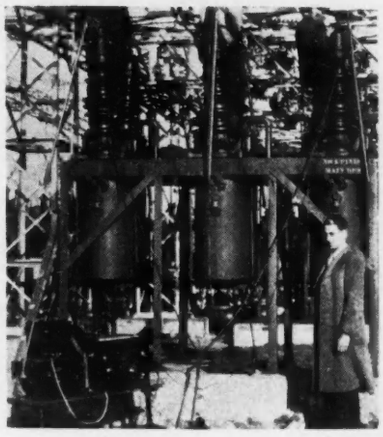
•

Audio Frequency Aids Bushing Tests

For about five years a Pennsylvania utility has been using a low-voltage Schering bridge (General Radio) operating at 1,000 cycles for periodic testing of various classes of bushings. Its use of 100 volts at an audio frequency, according to the test engineer of the utility, while at variance from the current practice of using at least 10 kv. at 60 cycles in insulation testing, gives excellent results in picking out defective insulation. Any injury to insulation, whether due to admission of moisture or to ionization, increases the existing polarization and hence the dissipation factor at either frequency.

Employment of a measuring frequency as far away from 60 cycles as 1,000 cycles permits measurements to be made conveniently in switching stations and under live overhead buses. The actual value of the dissipation factor measured at 1,000 cycles is less than that found at 60 cycles by a factor of 2 or 3. Although this ratio varies both with the magnitude of the dissipation factor and with the kind of insulation, it is as easy to set up limits for rejection at the higher as at the lower frequency.

On this system about 5,500 tests have been made on the bushings of oil circuit breakers and transformers with voltage ratings ranging from 33 to 110 kv. On the average a bushing is tested twice yearly. The range of dissipation factor of a good bushing is from 0.5 to 1 percent, and the normal limit for rejection is 2 percent, with slight variations for the different classes. If the increase from normal has been slow, the limit may be raised to 2.5 percent, provided that tests are made at more frequent intervals.



TESTING BUSHINGS with G.R. type 716-A capacitance bridge (right) and type 508-A oscillator (left end of bench); special selective amplifier on top protected from vibration by sponge rubber. The three units weigh 120 pounds total, are portable and can easily be stored in the trunk space of any automobile

An example of the progressive deterioration of a bushing and the results of its subsequent reconditioning are given in the table. This type of work is useful in forestalling failures of service of extreme importance in ordinary times and of immense consequence under war conditions, when the rehabilitation of equipment for further satisfactory use is vital in relation to the material situation and when interruptions cannot be tolerated in the supply of energy to war plants.

The bushing mentioned in the table was removed from service with a dissipation factor of 2.23 percent and returned with only 0.8 percent. For a bushing showing no deterioration the

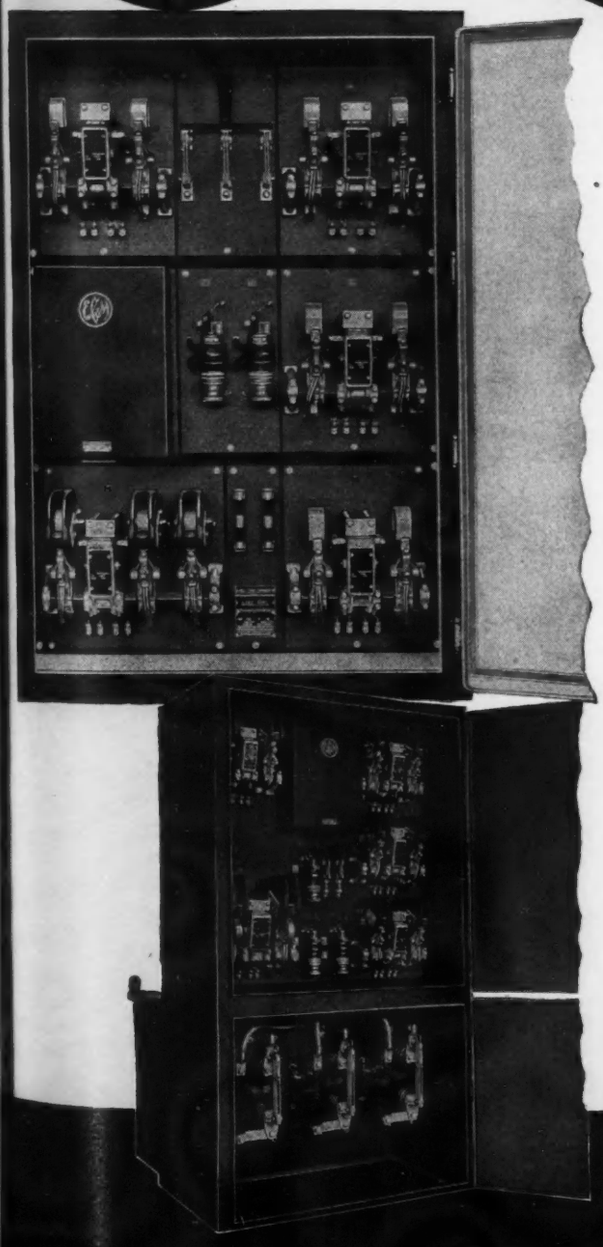
66-Kv. Bushing—Condenser Type—No. C-77

Elapsed Time Between Tests		Capacitance $\mu\mu f$	Dissipation Factor %	Resistance in Megohms	Comments
Months	Days				
0	0	248	1.08	10,000	Field test
7	13	241	1.13	10,000	Field test
7	17	212	2.23	10,000	Removed for repairs
7	5	178	0.8	1,000,000	Final shop test
6	0	225	0.68	10,000	Field test 40 deg. F.

A New Method FOR CONTROLLING A-c WOUND-ROTOR MOTORS

The NEO-TIME-CURRENT METHOD OF ACCELERATION

THE ELECTRIC CONTROLLER & MFG. CO. E&M CLEVELAND, OHIO

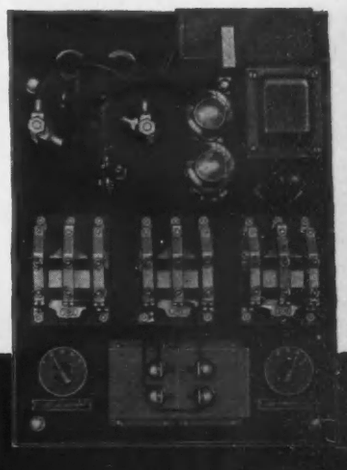


As its name implies, NEO-TIME-CURRENT Control is designed to accelerate the a-c wound-rotor motor in the *shortest, safe* time. On normal loads, closure of the secondary acceleration contactors is as fast as the motor is able to accelerate the load. Time is *short* on light loads—automatically *lengthened out* on heavier loads to keep current peaks down and motor-torque increasing.

On abnormal loads, the characteristics of the wound-rotor motor are such that forcing the motor by cutting out secondary resistance beyond the maximum torque-point will only result in decreasing torque developed by the motor and in increasing motor current. If the motor is stalled, NEO-TIME-CURRENT will short out secondary resistance to *increase torque gradually,* giving greatest time per step until the *maximum torque-point* is reached. If the motor cannot accelerate the load on this point, the overload relays will operate to disconnect the motor from the line.

This new system of control for push button operation of conveyors, crushers, etc., etc., has many advantages. Acceleration is *automatic.* Time is varied *without human attention* according to the load. Acceleration to the maximum torque-point *guarantees starting* or the overload relays remove power. Ask our nearby sales office about NEO-TIME-CURRENT for your a-c wound-rotor motor problems. The Electric Controller & Mfg. Co., Cleveland, O.

Close-up view of NEO-TIME-CURRENT Acceleration unit. No dashpots are used. Timing is obtained from a simple electronic circuit which automatically compensates for variations in voltage. Adjustment, when necessary, by 2 convenient dials. Could anything be easier!



THE ELECTRIC CONTROLLER & MFG. CO. E&M CLEVELAND, OHIO

EC&M NEO-TIME-CURRENT CONTROL

for Push Button Operation of A-c Wound-rotor Motors

dissipation factor readings year after year are consistent to plus or minus 10 percent.

On this system bushings are also tested for resistance both in the field and during shop repairs as shown in the table. Transformers and generators are tested by a General Radio type 544-B megohm bridge at 500 volts.

The change in resistance is observed for a considerable period and the condition of the insulation inferred from the way in which this change occurs.

•

More Steam—How?

3. Dealing with Sludge *

By ALFRED IDDLES
Application Engineer, Babcock & Wilcox Company

Large quantities of sludge are troublesome by adhering to tubes at their entrance from headers or drums and by piling up in the headers to interfere with circulation. Deposition of this sludge at troublesome points can in some degree be prevented by suitable design. Dead points in the circulation can be eliminated and appropriate blowdown, either intermittent or continuous, can be provided for partial removal of sludge. However, some treatments produce a sludge which will accumulate in tubes that have rapid circulation and either stop the water flow by constriction or be baked on in semi-scale form. This will result in decreased heat transfer and tube failures.

It is common practice for some chemists to question immediately the circulation when a tube failure is discovered. They say that there is inadequate water or there is too much steam for the water flowing through the tubes. It would appear that all one has to do is increase the circulation to prevent troubles, but such a viewpoint does not take into account the fact that a great many failures in water wall tubes are at the lower end where the water-steam ratio is as much as 200 to 1 and the velocities as high as 3 or 4 ft. per second. Failures are seldom in the upper end of the tube where maximum steam volume exists.

I should like to pose a question for these chemists. First let them determine and clearly set forth at least, in their own mind, the quality of feedwater which they feel able to provide. If this is less than perfection, then let it be frankly set forth. And then if they think that the circulation is inadequate under the conditions which they can provide, suppose they try to find out what is adequate. If, as frequently happens, they persist in saying that the heat input is high and therefore scale is necessarily to be expected, then let them actively search for the end point so that they will be able to say what amount of heat input is permissible with the type water which they feel is commercially available. While they are doing this, let them take into account the fact that economic questions enter into this problem.

The owner wishes to obtain the maximum output from given investment and necessarily there always has been and will be a problem of balance between the amount of circulation and rate of heat input, on the one hand, and the quality of water which can and will be provided, on the other hand. The correct answer is one which provides the over-all minimum cost of power production.

Some chemists have been very successful in changing the character of this sludge, by proper conditioning of water in the boiler, to an extent where it is not troublesome. This is an exceedingly important item for all plants where it is necessary to use large quantities of raw water and especially where high pressures and high output are used.

* This series began in the May 16, 1942, issue of "Electrical World"; adopted from author's talk "What the Operator Wants to Know" to Steam Power Division, A.S.M.E. Metropolitan Section, March 25, 1942.

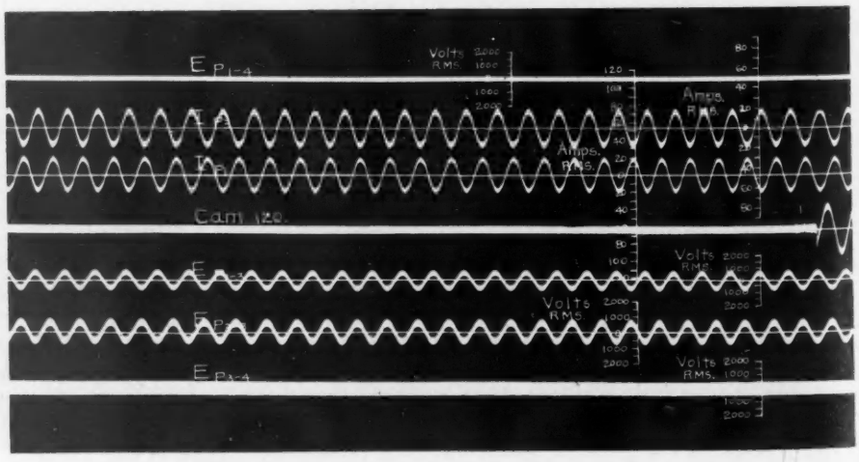
How to Get Clearer Oscillograph Films

Three simple rules, closely and carefully followed, have given Public Service Electric & Gas Company unusually sharp and clear oscillograph films. These are the rules as reported by E. J. Mommo, electrical engineer at the testing laboratory, Irvington, N. J.: (1) Use an X-ray developer—this gives a stronger contrast than would a commercial film developer; (2) use this developer double strength—twice the amount suggested in the directions; (3) use lukewarm water—30 to 35 deg. C. In summer slightly cooler water is used to keep the film from sticking. The same rules are followed for developing celluloid or paper film, except that in the case of paper film it is wet thoroughly before being put in the developer. Generally, films are not developed for any definite length of time, but are watched to see when the proper contrast has been reached.

After the film has been developed and washed it is kept constantly moving in the fixing solution. This insures thorough fixing and results in clear background of films.

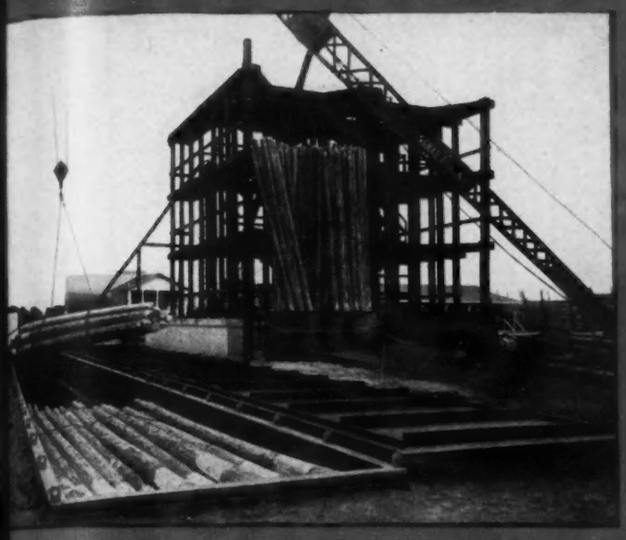
The final washing is done in running water, rather overwashing the films to rid them from any traces of fixing solution.

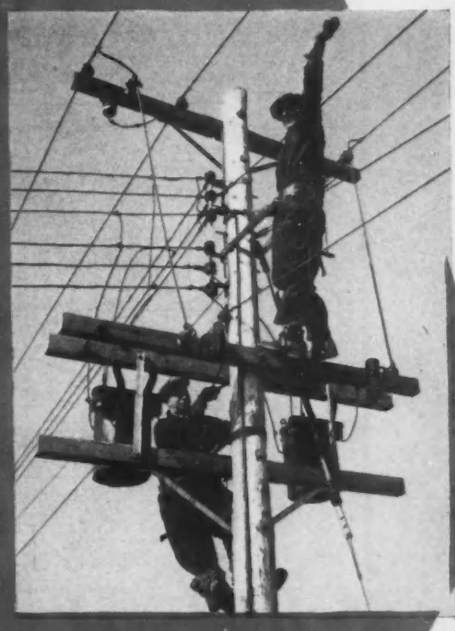
The accompanying illustration shows—as well as a reproduction can—the typical results obtained with a celluloid film. Since it is a special film, the proper scales are inked in in India ink directly on the film. In other instances oscillogram scales are printed directly on a form that is attached to the film (ELECTRICAL WORLD, March 7, 1942, page 77).



OSCILLOGRAPH FILM is sharp and clear

POWER LINE ECONOMY In 3 STEPS!





Decay Resistant From Top to Butt!

Nature has built into the heartwood of cedar poles a resistance to decay and insect damage unmatched in other pole timbers. Now, through a special tox-i-tizing process, heartwood durability has been brought to the surface. Life-Span Cedar Poles are decay resistant top to butt—treated full-length with a potent highly chlorinated phenol plus the regular incised-process butt treatment. For long life, trouble-free service and economy specify Life-Span Cedar Poles. To insure delivery when needed, anticipate your requirements and contact your supplier now.

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50 Church St., New York, N. Y.

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LIFE SPAN *Tox-i-tized* CEDAR POLES

CONSOLIDATED TREATING CO.

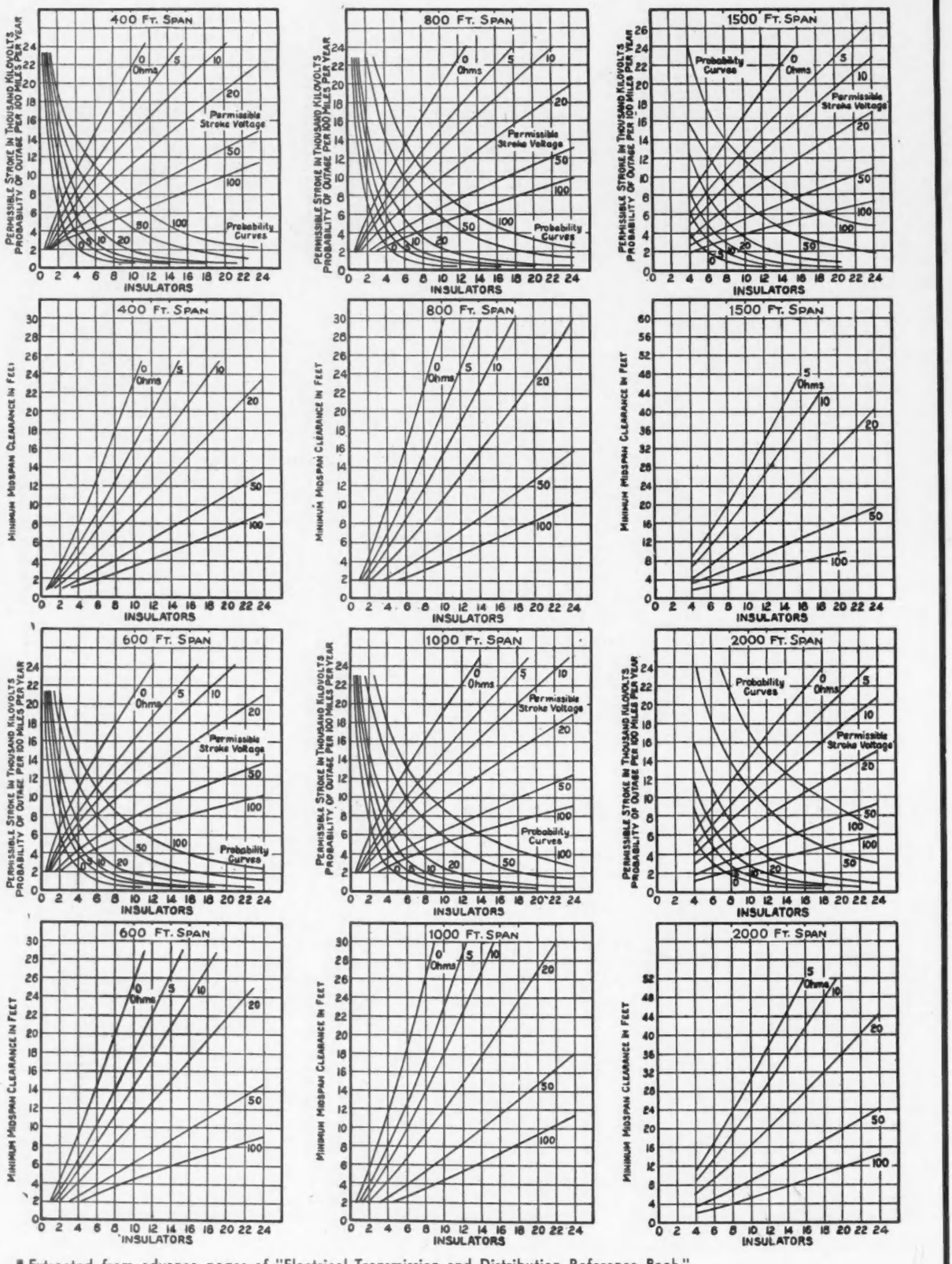
MINNEAPOLIS, MINNESOTA

HOW TO ESTIMATE LINE INSULATION

By A. C. MONTEITH

Manager Industry Engineering, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

Curves* for estimating line insulation and performance for various span lengths are based on 10-in., 5¾-in. spaced suspension insulators, or equivalent, and an isoceraunic level of 30 storms per year. Numerals on the curves indicate tower-footing impedance.



* Extracted from advance pages of "Electrical Transmission and Distribution Reference Book."

He needs POWER to back him up

Moloney Power Transformers

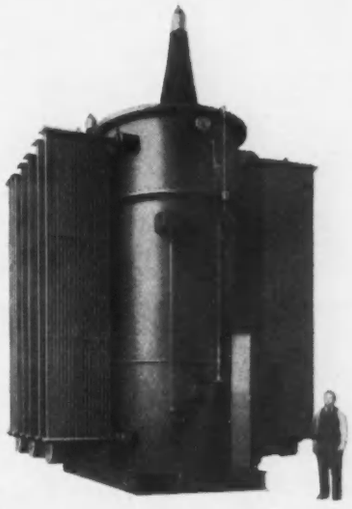
are on the job supplying power to vital war industries

Electric Power is basic to production. It multiplies man power; it supplies energy to the machinery that produces tanks, planes, ships, and guns.

The more power America utilizes for war production, the harder our blows at the Axis will become. The Moloney Electric Company is producing a steady stream of power transformers in its cooperative effort to bring the war to a victorious close by the Allied Nations—*quickly.*

Utilities, industrial plants, and power generating sources now using Moloney Power Transformers appreciate the extra life and dependability built into every Moloney Power Transformer. We are justly proud of our product and are striving together with all other Americans to supply our boys with more and better equipment with which to win the war.

If you need power transformers that will stand up under any and all operating conditions, and need them *in a hurry,* write to us today.



Above is one of three 25,000 Kva transformers rated 161,000 Y to 13,200 volts.

MOLONEY ELECTRIC COMPANY • ST. LOUIS, U. S. A.

POWER AND DISTRIBUTION TRANSFORMERS EXCLUSIVELY SINCE 1896

Brazing Restores Reaction Nozzles

Severely eroded turbine nozzle partitions on stationary diaphragms in the first 17 reaction stages, damaged by water in saturated steam under sustained light load operation, were rebuilt substantially to original measurements at one of the better-known generating stations in the north central area. Accomplished with plant shop facilities, the repair restored the machine to service in a much shorter time and with less expense than the expedient of ordering new nozzle blocks from turbine manufacturers with their present crowded production schedules. Under war conditions new nozzle diaphragms, of a special alloy, would have required several months to deliver. By repair on the job the diaphgrams were ready to be replaced within a few days.

Original turbine nozzles were of monel metal, silver-soldered to nozzle blocks, which in turn were keyed to the stationary turbine diaphragms in the conventional manner. Since use of a high melting point alloy for building up the worn exhaust edges of the nozzle blades would have loosened the silver solder, the repair was made with bronze. However, since bronze is a low strength metal, compared to monel, a generous fillet was built up between the nozzle and its block in restoring the blades.

Technique of making the repair by brazing is but slightly different from conventional methods. The lightest possible flame was used to avoid heating the silver solder to the melting point. It was also found desirable to "skip" around the diaphragm instead of restoring a number of nozzles in one section—again to avoid excessive local heating. After nozzle blades have been built up sufficiently they are carefully smoothered to contour, using a set of fine files.

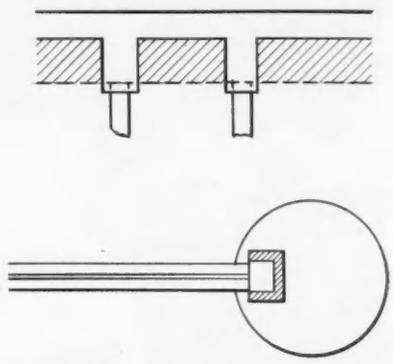
It is interesting to note from the accompanying illustrations that where reinforcing wires pass through the monel blades they have been substantially free from erosion, while blades between are quite badly eroded.

•

Fuel Oil Tank Salvaged, Re-erected

A Northwest utility is having a riveted steel fuel oil tank erected, with a capacity of 64,000 bbl., for a standby steam plant. No new steel will be required, the tank being one that had been located elsewhere for crude oil storage but had not been put into service.

The purchased tank was carefully inspected by a competent authority, whose report showed all parts to be in first-class condition. Contract was entered into with a local contractor to transport the materials and erect the tank. In addition to providing the foundation, the utility will also cut the necessary openings and weld in the nipples. Otherwise, from the time of loading the material on the cars until final testing on the foundation, the contractor will be responsible.



SKETCH at top shows how wood piles were cut off at level of water table and concrete column extensions from the slab set on them. Below is plan of oil tank showing heater set in wear outlet and supplied with steam by a 12-in. line in which is a 1½-in concentric pipe for return of condensate.

The tank is approximately 35 ft. high by 115 ft. in diameter. Foundation consists of a reinforced concrete slab 1 ft. thick, which, because of the character of the location, is supported on piling. Piles, from 12 to 16 in. in diameter and 40 ft. in length, were driven on 4-ft. 3-in. centers each way.

To insure maximum life of the piles, all were cut off after driving to a level with the water table. Instead of placing the slab directly on the piles it is carried on concrete column extensions, one for each pile. These extensions are 24 in. square and extend 4 ft. below the under side of the slab, each forming a cap for the pile under it, and setting down over the latter a distance of 4 in. This construction places the slab well above water at all times of the year.

The tank rests on a 6-in. sand pad on top of the slab, the pad to be saturated with crude oil to prevent corrosion of the bottom. In all respects the tank is being located and installed in accordance with standards of the National Board of Fire Underwriters for installation of containers for storing and handling flammable liquids.

When erected the tank will be con-

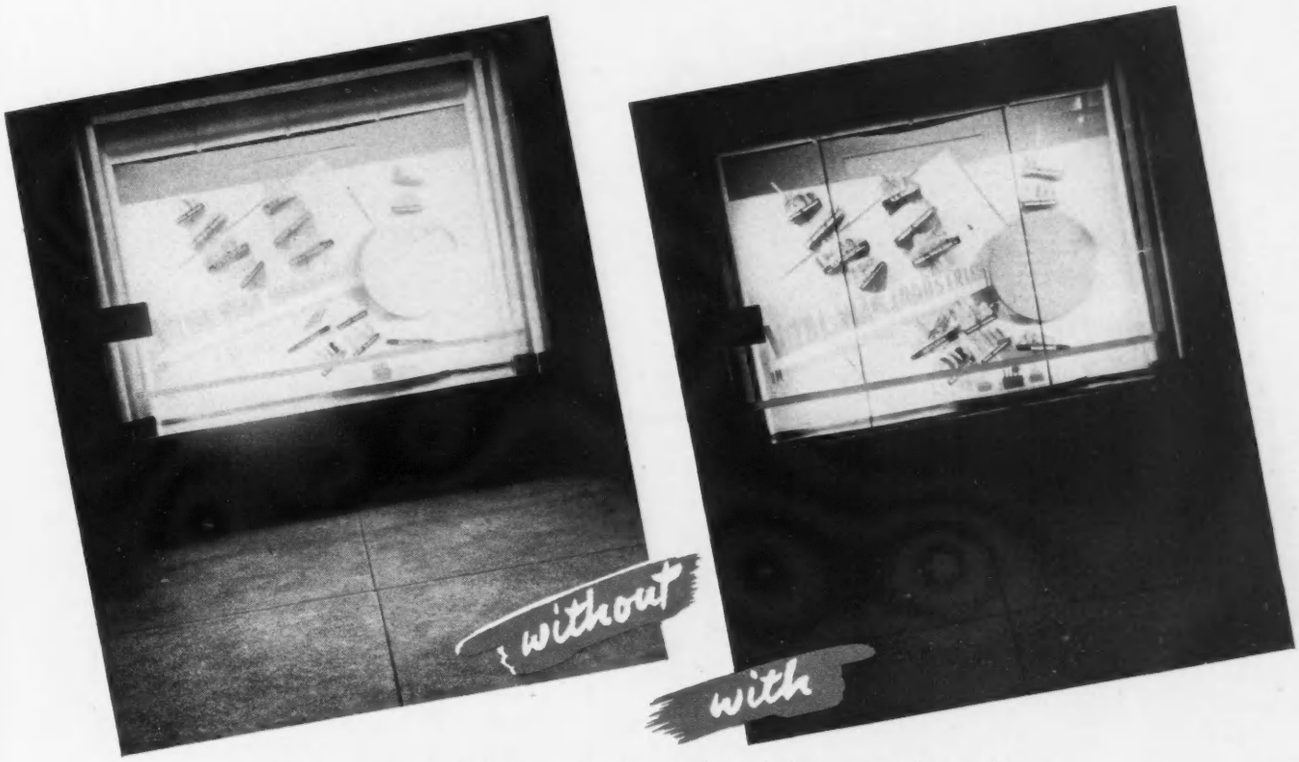
SECTION OF STATIONARY reaction nozzle diaphragm before repair (above) and after being rebuilt by brazing (below)

Without DIMOUT of display

the new Celanese*

"DIM OUT SHEER"

Permits Full View of Store Windows!
Prevents Light Rays Escaping!



These unretouched photographs of a display window were taken under identical conditions—with and without Celanese "Dim Out Sheer" curtain.

Tests have demonstrated that the new Celanese "Dim Out Sheer", transparent black fabric, cuts out approximately 75% of light reflection without obstructing the view of show windows under *normal* lighting. To prevent light rays from escaping to the street, a curtain of Celanese "Dim Out Sheer" is placed between the light and the window glass. The merchandise remains clearly visible. Stores on the seaboard can now help to meet the problem of window displays under dimout conditions without forfeiting the patronage of passersby.

CELANESE CORPORATION OF AMERICA

180 Madison Avenue, New York City

*Reg. U. S. Pat. Off.

Under a current ruling of the Federal Trade Commission, CELANESE yarn is classified as RAYON

nected with the present oil pump house by means of a 12-in. pipe line for filling and suction. The oil is to be heated at the suction intake by means of a steam heater supplied by a 4-in. steam line. Condensation from this heater is then to be returned by means of a 1½-in. line threaded through the 12-in. line, for the purpose of heating the oil during the start of suction operations.

No auxiliary equipment had to be bought, present equipment sufficing for the operation of the new unit. In the utilization of this steel, which could have been done in no other way, unless at excessive cost, there is a good example of salvaging the utility value in the steel instead of turning it into scrap.

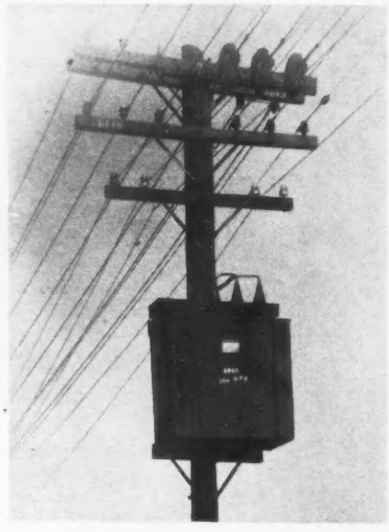
•

Capacitors Benefit Cambridge System

To increase system firm capacity and also to reduce loads on transmission, substation equipment and 2,300-volt distribution feeders, a New England utility installed 56 General Electric capacitor units aggregating 5,010 C-kva. on its pole lines within the city. Due to the high reactance of the tie cables with a neighboring system, capacity was limited below the ampere capacity of the cables by the voltage drop. An improvement in power factor was sought in the interest of providing a substantial increase in firm capacity.

A large synchronous condenser was first considered. This would give all available addition to the firm capacity, but since the low power-factor load was on the 2,300-volt system, it seemed that further benefits could be derived from installing static capacitors there. After studies of substation loads where each circuit is equipped with an ammeter, voltmeter and kilowatt meter, it was determined that 5,000 C-kva. in unswitched capacitors could be installed on the 2,300-volt system. The remaining C-kva. could be added in switched capacitors, or in a synchronous condenser.

Kilovar readings were taken throughout the 2,500-volt system with a var-meter and a study was made to determine the size and location of the capacitor to give maximum correction benefit at full load without objectionable voltage rise at light load. The capacitors installed aggregated 5,010 C-kva. of the housed type units, installed in the following sizes and numbers: ten 180-kva., nine 120-kva., thirty-four 60-kva. and three 30-kva. ratings, each equipped with a discharge resistor. The total installation cost was $7.99 per C-kva. Indicating drop-out type expulsion fuses were used so that periodic inspections for outage can be made easily by car. Most locations were chosen near existing transformers already equipped with lightning protection, but arrest-



TYPICAL pole type unit serves 2,300-volt distribution feeders. Fiber U-Guards cover conductors under crossarm and in down-pole run

ers were installed at a few isolated places. Since the installation of the capacitors no trouble has been experienced from lightning, high voltage at light load or blown fuses due to harmonics.

On the 1941 peak load the capacitors improved the power factor from 88.6 to 93 percent, resulting in an increase in firm capacity of 4,500 kw. In addition, the following benefits were realized: (1) Reduction in system losses estimated at $2,130 yearly; (2) reduction in purchased power due to increased generation worth $6,060 yearly; (3) an over-all improvement in voltage regulation of about 1 percent. A decrease of 1,200 kva. in transmission, substation and distribution feeder loads will result in a future saving in investments in these facilities of about $40 per kva., or $48,000. All these benefits were derived from an unswitched installation costing about $39,957, or about $5,000 per annum at 12.5 percent.

Secondary Breakers Give Adequate Service

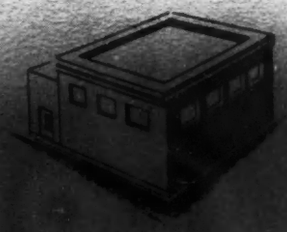
To make the best possible war-time use of medium-voltage switchgear and avoid purchasing any equipment not absolutely necessary a Midwest utility departed recently from its conventional methods by connecting a new substation transformer bank directly to a 46-kv. line. A new small-arms ammunition plant and an increased industrial load due to war material production required increased step-up transformer capacity from 13.8 kv. to 46 kv. at the main generating station. In line with actual load increase and for immediate needs a 30,000-kva. bank was required.

The conventional method with double buses on both low and high sides of the bank would require four oil switches on the new bank, but by feeding directly into one of the 46-kv. transmission lines tying directly to the major distribution center of the system the necessity of two 46-kv., 1,000,000-kva., interrupting-capacity oil switches is eliminated. The 46-kv. bus at the distribution center is sectionalized so one transformer bank receives the output of the new bank over the transmission line. Faults on this line with a transformer bank on each end is relayed out by high-speed directional impedance relays on each end on the low-side oil switches.

Further to utilize the new bank in case of transmission line outage a sectionalizing air-break switch already in the line and a set of disconnect switches can be used to disconnect the high-side of the bank from the bus and tie the output of the new bank into either of the two 46-kv. station buses through the present transfer switch for parallel operation of transformer banks. Similarly the receiving end bank can also be fed from the distribution station 46-kv. bus. This arrangement fits in with the improved relaying planned for the 46-kv. transmission system in which two direct transmission lines between the generating station and major distribution station will operate with their individual transformer banks on each end. Faults in the line or transformers will be cleared by the oil switches on the low-voltage side of the transformers relayed by the high-speed directional impedance relays.

While this connection is not as easily switched when the bank feeds

NOW REGULATORS ARE AIR-MINDED, TOO



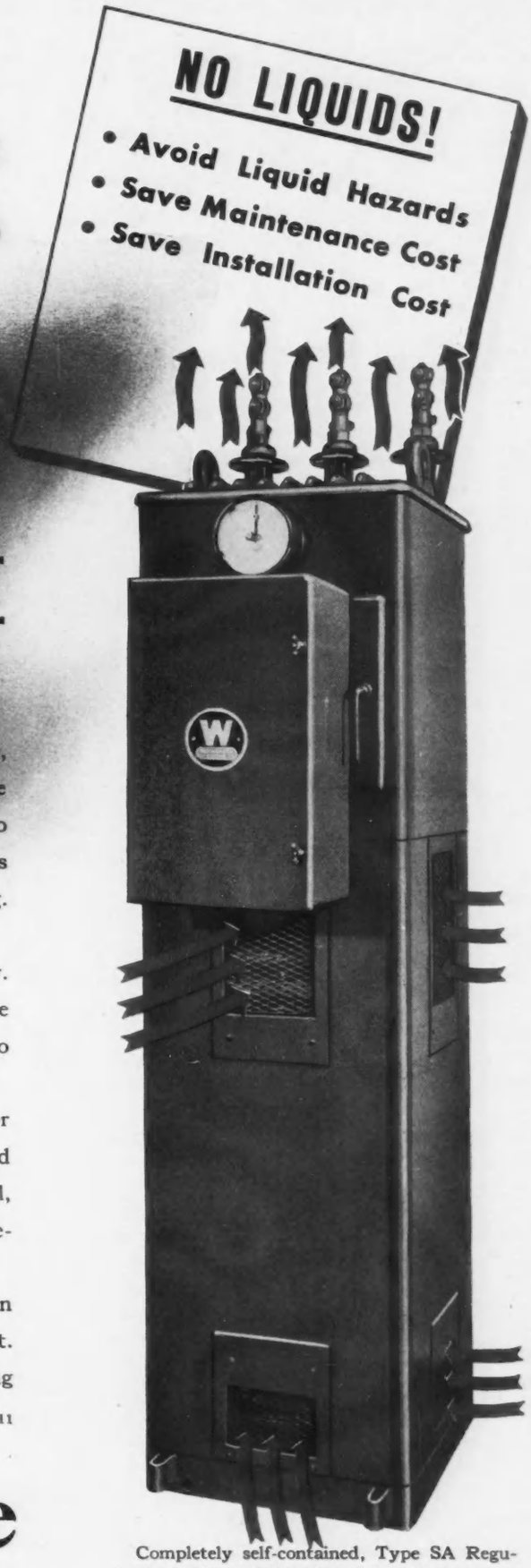
New Westinghouse Indoor Feeder Voltage Regulator cooled *BY AIR!...*

With this new air-cooled Type SA Regulator, Westinghouse makes possible close feeder voltage regulation at new low cost. There are no liquids to store, condition, or handle. The SA Regulator depends only on the natural convection of air for cooling. Consequently there is no fire or explosion hazard.

With simplified basic design, installation is easy. Built-in lifting eyes help put it in position. When the leads are clamped to the three bushings, it's ready to go to work. No catch basins or vaults to build.

Accurate performance keeps voltage steady under most severe conditions, safeguarding customer good will and revenue. Regulation is smooth and gradual, voltage is confined to narrow band width. Maintenance costs reach a new low.

Free booklet describes Type SA Regulators in detail. Ask your Westinghouse Representative for it. Or, write to Westinghouse Electric & Manufacturing Company, E. Pittsburgh, Pa., Dept. 7-N. J-10211



Completely self-contained, Type SA Regulators are intended for indoor service for regulating 2400 and 4800-volt, single-phase circuits. Also applicable to 3-phase, 3-wire and 3-phase, 4-wire systems.

Westinghouse

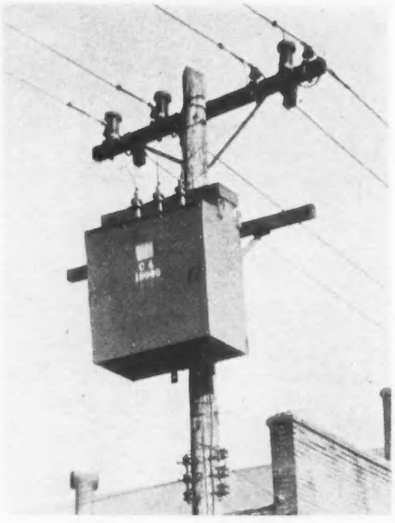
VOLTAGE REGULATORS

directly into the 46-kv. generating station bus, it will only operate that way in an emergency. With normal operation of the bank feeding directly into the transmission line, fault currents on the 46-kv. bus are kept to the same value as before the bank installation, a very great advantage when some of the older 46-kv. oil switches are subject to fault currents near their rated interrupting capacity.

•

Capacitors Forestall Feeder Overloading

Increases in capacity at the points where needed on a 4-kv. distribution feeder were obtained by installing capacitors, according to W. G. Robinson of the Laclede Power & Light Company of St. Louis, Mo.



INSTALLATION of one of numerous 180-kva. capacitors on 4-kv. distribution feeders

During the summer of 1939 the loads on several 4-kv. distribution feeders had reached their safe capacity. Some form of relief was necessary to prevent an overloaded condition on these circuits, as some increase in load was expected to result from normal growth. New feeders were not justified because of their location and the small increase expected in load.

Calculations showed that installation of a 360-kva. capacitor near the end of one particular feeder would, at times of heavy load, raise the power factor from 0.67 to 0.79 and reduce the line current from 220 to 186 amp. At times of light load it would change the power factor from 0.80 lag to 0.89 lead and reduce the line current from 50 to 45 amp. Voltage at the load would be raised at times of heavy load from 4,030 to 4,070 with no change in the regulator settings. Regulated voltage at the station would be reduced from 4,575 to 4,510. At times of light load the voltage at the load would be raised from 4,050 to 4,075, and the voltage at the station would remain approximately the same as without capacitors.

Although this feeder was somewhat longer than average, the results are about the same as to be expected for one of average length and load. Two 180-kva. General Electric capacitors were installed on the feeder and the results followed the calculations very closely. Capacity of the feeder was increased 240 kva. at a cost of $15 per kva. A new feeder would have cost $28 per kva. and its full capacity could not have been utilized for some time.

Subsequently eighteen 180-kva. capacitors have been installed on the system, giving an increase in feeder capacity of approximately 2,160 kva. Results that may be accomplished with capacitors are limited on each feeder to approximately the values given above. However, these small increases in capacity can be installed at the points where needed and the capacitors can be moved later to other locations as conditions on the system change, whereas new feeders can give relief only to rather limited areas. A number of feeders, representing quite a large investment, would be required to increase capacity over a widespread area. These feeders would not bring an immediate return on the investment, as loads would not increase with the feeder capacity.

• • •

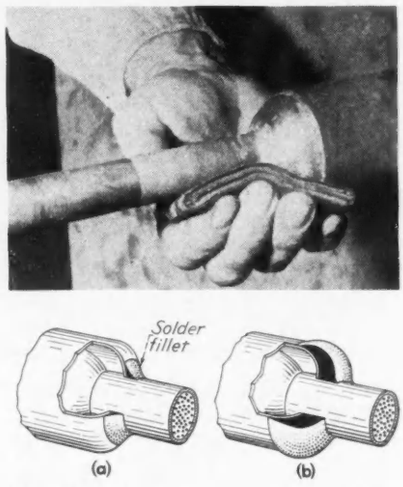
"Victory Joint" Saves Tin in Wiping Solder

By J. T. LOWE
Outside Plant Development,
Bell Laboratories, Inc.

A new tight-wipe or fillet joint recently worked out by the Bell Laboratories will save for the nation's war effort about 60 percent of the tin which would otherwise be used by the Bell System for wiping solders. In addition, tests to resistance and gas-tightness of the new joints show them to be fully as good as the old ones; the technique of making the joints is also somewhat simpler, and the splicing forces like the new joint.

Essentially, the new method consists of a careful beat-in of the sleeve ends to the proper shape to facilitate formation of a satisfactory fillet of solder and obviate the practice of rounding out the sleeve ends with solder. In the making of Y-joints not so large a proportion of solder can be saved because of the difficulty in removing the excess material from the spaces between the cables. Even there, however, considerable savings can be realized.

The idea of wiping joints with a reduced amount of solder is not new. An approach to this was made by one of the associated companies some time ago with satisfactory results. Recent work by the laboratories has carried the curtailment of solder much further, however, to a point which appears to be about as far as is practicable.

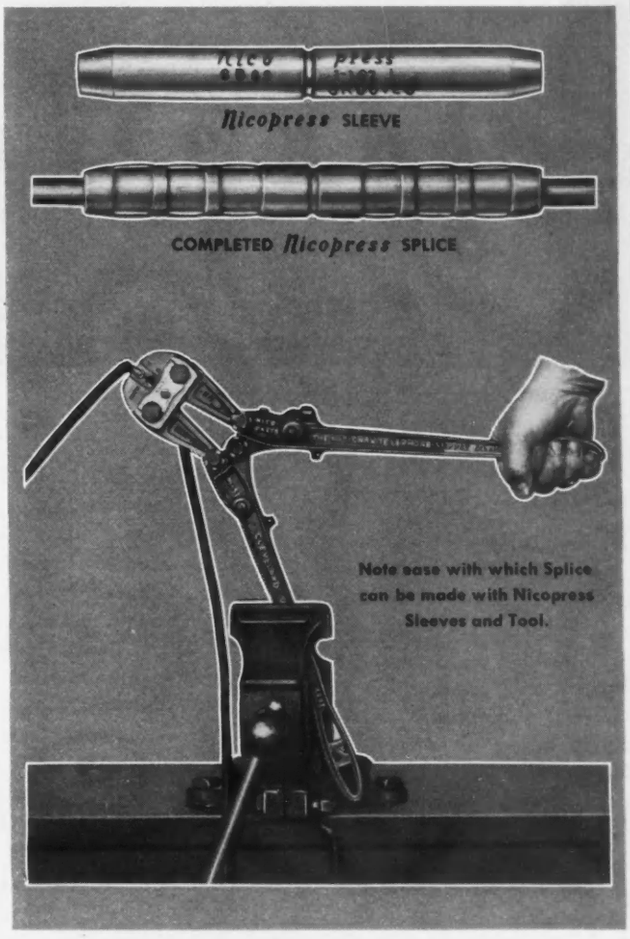


"VICTORY JOINT" saves tin
Sixty percent of the tin which would be used in wiping solders by the Bell System will be saved for the war effort through the use of a newly developed cable joint. New cable joint is shown at (a), as compared with previous joint at (b). Final wiping of the joint is illustrated at top

An improvement in lead cable solder which cuts down on the dross, saving skimming time and avoiding porous joints, was developed by the laboratories some time ago. This consists in the addition of $\frac{1}{10}$ percent of arsenic to an alloy of 37.25 percent tin, 62.75 percent lead (ELECTRICAL WORLD, October 5, 1940, page 92).

Economy In SALVAGE

. . . Save Your Odd Lengths of Line Wire and Concentric Cable the Easy Way—With *Nicopress* SLEEVES



Now, when metals are so urgently needed for war production, and wire and cable are so essential, it will certainly pay to salvage every bit of wire.

The Nicopress Method of splicing Line Wires and Concentric Cables is especially well adapted for this job.

For making line wire joints Nicopress sleeves and Tools quickly do the job, assuring neat joints that are only a very little larger in diameter than the wire itself. Because of the shortness and compactness of the completed splice the wire coils easily. The joints are tight and exceed the rated breaking strength of the conductors.

The use of Nicopress for splicing concentric cable greatly simplifies and speeds up the work. It assures small neat joints that can be easily taped. As the sleeve used for the stranded neutral is split the entire length and the bore chamfered, feeding in the stranded wire is greatly facilitated. All joints are tight and strong.

You'll make real savings and be prepared to meet many emergencies by salvaging your wire and concentric cable the Nicopress way.

ORDER NICOPRESS SLEEVES FROM YOUR JOBBER TODAY

Nicopress Sleeve for Solid Wires of Concentric Cable

Nicopress Sleeve for Stranded Wire of Concentric Cable

Completed Nicopress Concentric Cable Splice

THE NATIONAL TELEPHONE SUPPLY COMPANY

Manufacturer of Specialties for Power and Communication Lines

5100 SUPERIOR AVENUE • • CLEVELAND, OHIO

Canadian Mfr.—N. SLATER CO., LTD., HAMILTON, ONT., CANADA

Export Distributor—INTERNATIONAL STANDARD ELECTRIC CORP., NEW YORK, N. Y.

LOAD SERVICING

Industrial • Commercial • Rural • Residential

Informative Ads Win Public Understanding

Widely acclaimed by customers for their straight-from-the-shoulder, common-sense approach are the recent series of informative newspaper advertisements of the Wisconsin Public Service Corporation. The two advertisements reproduced explain why there are to be no more service extensions over 250 ft. in length and show customers how they can help the rubber conservation program and still be assured of adequate service by the exercise of foresight in their service demands.

Text of the service extension advertisement points out that because every war material is needed for fighting forces the WPB has ruled that copper must not be used for electric service extensions of more than 250 ft.; galvanized steel wire up to 2,000 ft., for old homes without electric service but wired before March 26. Every case, the advertisement continues, must be submitted to the WPB for approval, "so don't be angry with us or your government if you can't have electric service at all." "There's a war on, and no one wants to see it end in victory more than you do." The rule is simple and emphatic, the text points out: "We can't alter it in any way for even the most drastic cases, but we will be glad to discuss things with you."

For Mr. and Mrs. Oshkosh the advertisement lists eight ways they can secure satisfactory service while cooperating in the rubber conservation program:

1. If you are moving phone your "move" requests in as far ahead as possible—two or three days will not be too early.

NO MORE SERVICE EXTENSIONS OVER 250 FT.
TO THE FARM · HOME · SHOP · COTTAGE
INFORMATION
WISCONSIN Public Service CORPORATION
Mr. and Mrs.
OSHKOSH
To Continue Serving YOU for the duration . . . we MUST have YOUR HELP in Saving Vital Rubber!
Public Service CORPORATION

WISCONSIN UTILITY takes customers into confidence to build understanding of service and of extension restrictions

2. Give us as much opportunity to make the change as possible. Arrange so we can come any time during the day instead of a definite hour. It will not be possible to meet definite hour requests.

3. Special trips cannot be made to adjust an appliance. The work will be done on the next service man's trip near your home, perhaps a day or two later.

4. Saturday afternoon, Sunday and holiday calls mean special trips and are the most wasteful of rubber.

5. In most cases requests phoned before 9 in the morning can be taken care of the same day without special mileage. Call as early as possible—days ahead if you can—and we'll service you better and save rubber at the same time.

6. Emergency calls of a serious nature will continue to be taken care of as rapidly as men and cars can reach you. When you request such service please state the situation and location clearly as there may be an employee working in your neighborhood whom we can send to your aid.

7. Merchandise deliveries will be made in conformance with WPB delivery regulations.

8. Your service requests should be phoned to —— ask for the electrical department. If in doubt about whom you should call phone—and tell your problem to the person answering the phone.

"You may no longer get 'express train' promptness" — the advertisement warns—"but the savings we will make in rubber will enable us to serve you many months longer than would otherwise be possible."

•

Quiz Idea Is Basis of Clerk Training

THE QUIZ IDEA that has proved so popular with radio listeners and magazine readers in recent years has been applied effectively by one Indiana company to train new clerks for interview work in the customer service division and to develop the capabilities of older clerks.

Questionnaires have been worked

What about substitute materials for fluorescent lighting fixtures?

THE new "24 hour daylight" is vital to speeding today's production but so is the steel that goes into the fixtures which provide it. So, if you're considering fluorescent for a war materials factory, you'll be interested in these facts.

1. There is a strong probability that the use of steel will shortly be limited for fluorescent lighting fixture reflectors to release needed metal for war use.

2. In anticipation of this, considerable work has already been done on substitute materials which promise to give satisfactory service. Some actually have a higher reflection factor than porcelain enameled steel. Potential alternates, less critical for war needs, include wood fiber, asbestos, specially treated paper, gypsum, plastics . . . all finished with a highly reflective white coating.

3. Recently FLEUR-O-LIER Manufacturers met with the suppliers of such materials; discussed their possibilities and problems in production.

4. To conserve steel used in reflector fabrication, the War Production Board has asked the Bureau of Standards to design a standard form and size of reflector. We heartily subscribe to this program.

5. Existing stocks of steel reflectors are being offered for sale and according to our best information from WPB may be specified for war industry plants as long as they last.

To summarize, the research and development work for substitute materials has been practically completed. We are awaiting instructions from the WPB which will make possible Victory models of fluorescent fixtures carrying a minimum of critical materials.

FLEUR-O-LIER MANUFACTURERS, 2116 Keith Building, Cleveland, Ohio

★ **FLEUR-O-LIERS** ★

CERTIFIED FIXTURES FOR FLUORESCENT LIGHTING

Participation in the FLEUR-O-LIER MANUFACTURERS' program is open to any manufacturer who complies with FLEUR-O-LIER requirements

L-M Connector now stronger than ever

The L-M Connector is better now than ever. Its body of a new cast bronze alloy, machined all over, gives exceptional high strength and adds years of usable life.

Accurate overall machining results in perfect threads which give remarkably high pressure contact between conductors with low applied wrench force. Machining also gives the smooth surfaces and rounded corners which protect the conductor and make the connector easy to handle. The wide surfaces and V groove pad insure good current carrying capacity and prevent slippage.

On your next order specify L-M Connectors.

LINE MATERIAL CO.
MILWAUKEE, WIS. LM

out to test the new interview clerk's knowledge, courtesy and judgment in handling the public after he has spent a month studying a special manual of instructions for handling office interviews with customers. This manual also is used by the clerk for reference once he is on a regular interview job, and periodically he is given a carefully prepared questionnaire to answer. Replies to the questions are gone over thoroughly by the supervisor, inaccurate or incomplete answers are discussed, and then revised replies are submitted. The new clerk also spends some time merely observing the procedure of an experienced interview clerk.

•

Group Replacement Saves Tires, Gas

Analysis of previous experience by an Eastern utility reveals that replacement of street lamps on a spot basis took about 4 miles of travel per lamp; group replacement reduces the mileage to ¾. With a ladder truck the combined cleaning and replacement job on a twice-a-year basis is done by one man at the rate of 40 per day.

It is not felt that any lamp-life hours are lost. The 1,350-hour lamps were replaced three times a year, but the 2,075-hour lamps (field life about 75% of the 3,000-hour laboratory life) are being replaced twice a year with intervening cleaning where required by contract.

•

Conserves Mileage and Manpower

For conservation of man-power and auto mileage a California power company has adopted two successful new practices with reference to meter disconnects. Except in extraordinary circumstances meters are no longer disconnected following a move and final bill. A card is simply hung on the meter instructing the customer to close the service entrance switch. A portion of the card constitutes an application form and the customer is advised to tear this off, sign and mail it.

Where a customer calls at the office for service, the application clerk refers to a list of meter locations on file and if the residence is one where the meter has not been disconnected the customer is instructed to turn on service by closing the main switch. As a result service is immediately available on occupancy without a trip by a company employee.

Heretofore delinquent accounts were collected personally in some districts. Now the approved five-day shut-off notice is mailed with a letter to the effect that service will be shut off on the specified date without further notice unless the account is paid. The letter also states that there will be a $1 reconnect charge and that service will not be restored except on the scheduled day for that area. This latter statement is based on a plan of staggered service for various areas according to a prearranged schedule.

Not only do these two plans save time of employees but they contribute to a 40 percent saving in automobile mileage that has been accomplished in the months since December 7.

•

Fuse Behavior Shown Store Visitors

TO HELP CONSERVE tires, gasoline, man-power and speed up restoration of service in case of trouble on customers' premises, an Eastern power company designed a convenient dem-

TYPICAL demonstration of fuse replacement to a consumer of electric service

onstration table featuring fuse replacement methods and showing the effects of overloading circuits. The table is 3 ft. wide by 5 ft. high and is equipped with main switch watt-hour meter, fuse box, indicating lamps and facilities for connecting appliances for exhibit purposes.

The usual demonstration features the flow of energy from the distribu-

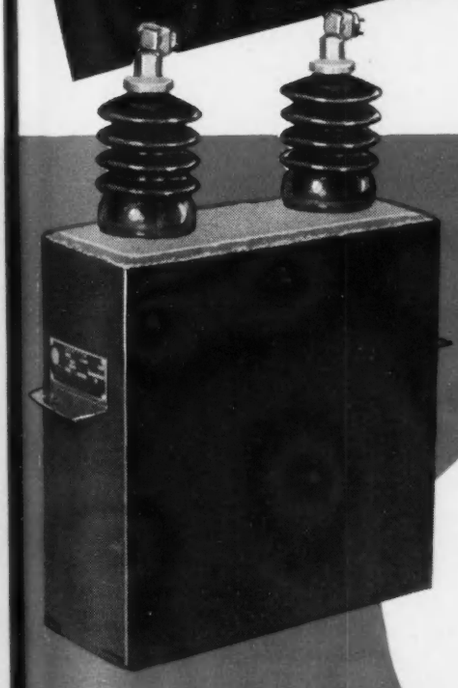
Maximum Expansion of System Capacity: Calls for C-D Capacitors

TEN kw-hrs NOW ARE WORTH MORE THAN 100 kw-hrs NEXT YEAR

Are you getting the most out of what you have? Do you know that C-D Dykanol Capacitors, by raising power-factor, will *increase* your system capacity by as much as 40%?

America's greatest battle is against time; one of her serious bottlenecks, the shortage of power. Capacitors can be produced with less materials and man hours than new generator and feeder equipment. Capacitors can be produced quickly; installed quickly.

Ask the C-D Power-Factor Engineer in your territory to show you how C-D Capacitors release generator capacity, increase substation loadability, boost feeder capacity and raise voltage level of load. Write for Bulletin 143C today. Cornell Dubilier Electric Corporation, South Plainfield, New Jersey. New England Division: New Bedford, Mass.



Individual Outdoor Pole Mounting Capacitor
With New C-D Four Petticoat Porcelain Bushing

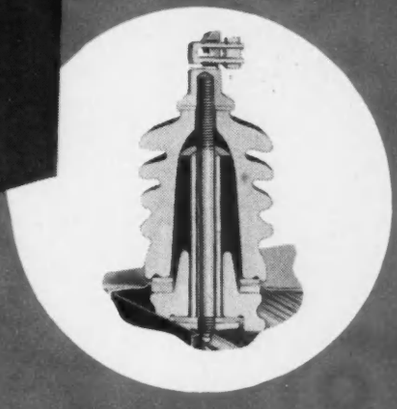
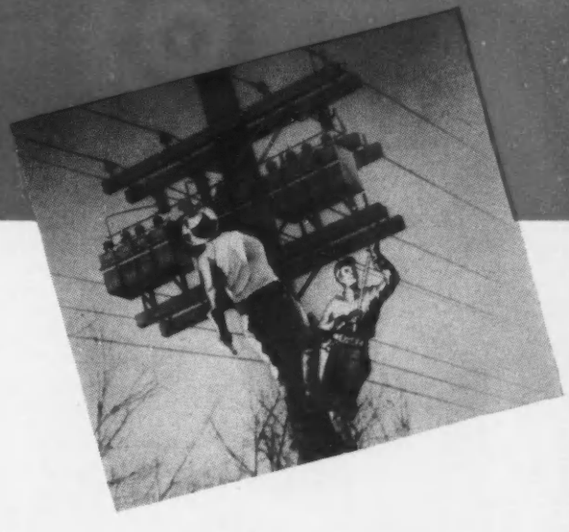


Illustration shows the internal construction of the new four petticoat, wet-process, glazed porcelain bushing, with which these capacitors are now supplied. These bushings were adopted after considerable field study. They afford a longer creepage path and less breakage hazard. The top of the bushing is fitted with the new sturdy, solderless connector exclusive with C-D. The bushing is double sealed to the case by bakelite heat-reactive varnished cork gaskets, held under pressure by heavy 7/16" solid brass studs. This construction has proved in operation completely reliable against leakage.



MORE IN USE TODAY THAN ANY OTHER MAKE*

Cornell Dubilier

capacitors *for power-factor improvement*

Reg. U.S. Pat. Off.

**including all applications*

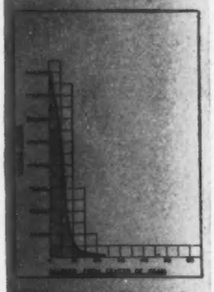
WAR PLANT
Production AND Protection
PERMAFLECTOR

Enclosed
FLOODLIGHTS

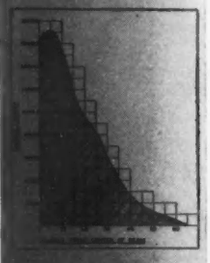
Minimum of Critical Materials Used

★ Designed and built expressly for our vital war of production, these Permaflector floodlights project a flood of high intensity light which effectively serves to defeat the saboteur or to accelerate the output of war material. These new enclosed Permaflector steel floodlights are complete, ready-to-install and consist of a formed steel case equipped with hinge and clamps, heat-resisting cover glass, cast iron base, wire cord grip fitting, three-foot length of duplex wire, mogul socket and a 1,000-watt size Permaflector, the silver mirrored glass reflector which provides engineered light control from extreme concentration to extra broad spread. Preadjustment at the factory permits the use of 300, 500 or 750-watt lamps with the 1,000-watt size unit. Completely weather-proof and corrosion-resistant, these floodlights are ideal for all outdoor floodlighting applications. They may be mounted on a vertical or horizontal surface or attached to a pipe and adjusted to almost any position.

War Uses
Construction Jobs
Docks
Mines
Pipe Lines
Power Stations
Railroad Yards
Substations
Viaducts



Concentrated Distribution of Floodlights Numbers ST-1150-C, ST-1110-C. Addition of Stippled Cover Glass Provides Narrow Distribution.



Broad Distribution of Floodlights Numbers ST-1050, ST-1010.

PITTSBURGH REFLECTOR CO.
401 OLIVER BLDG., PITTSBURGH, PA.

PITTSBURGH REFLECTOR CO. EW-6-42
403 Oliver Building
Pittsburgh, Pa.
Please rush complete data on Permaflector Enclosed Floodlights.
Name.....
Firm.....
Address.....

tion system through the main switch, meter, fuses and connected appliances, with an actual case of intentional overloading the circuit with resultant fuse burnout. A short-circuit can also be illustrated by plugging in a lamp or appliance with a defective cord. The proper procedure in fuse replacement is shown, with the opening of the main switch before putting back any fuse and indicating the need for removing overload or short-circuit before the circuit can be restored to service. The set-up includes provision for showing such hazards as the use of 30-amp. fuses on circuits designed for only 15 amp., incipient fires and the use of pennies or metal foil as fuse substitutes. The table can be used at women's clubs and other group meetings in "spreading the safety gospel."

•

Rural Wardens Switch Street Lights

Operating heads of a utility company in the eastern part of New York State soon discovered that volunteer air raid wardens in the territory like to assume responsibility, particularly where it concerns turning on and off lighting of an unusual nature.

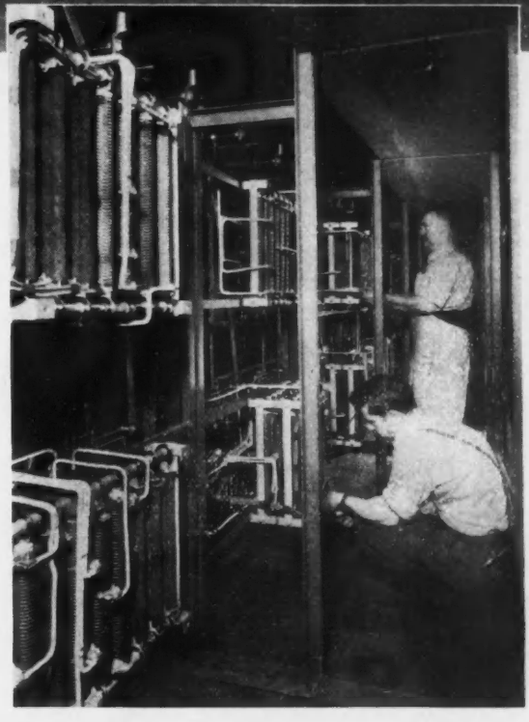
Capitalizing upon this human trait, the company now takes care of its rural street-lighting problem in a blackout by installing key switches at the base of poles carrying street-lighting equipment. Most companies find it is a difficult job to control street lighting in rural areas, but this New York company found that the people who live in these sections seem to enjoy the responsibility of turning the lights out and on again during a blackout test.

The same trait of human nature was capitalized upon in taking care of circuits which fed danger lights located on remote river crossings.

It would take the company employees a considerable length of time to travel to the outlying rural sections where these circuits could be controlled. Accordingly, the company brought the circuit down to the rural highway, installed a simple key switch, and delivered the key to the local warden of that area, who proudly assumes the responsibility of dousing the lights when a blackout has been ordered.

Monitor
BALTIMORE, MD.
The Original
JUST PRESS A BUTTON System

Not the largest, but one of the largest control jobs Monitor has ever built is this five unit assembly. Built for a large industrial plant in the East, this one installation combines in a single location all the controls for many pumps and compressors of large horsepower.



Charlie and Herman put the finishing touches on the rear-of-panel resistor banks. Note the ample space provided for easy accessability.

The Monitor Controller Company
GAY, LOMBARD & FREDERICK STS. BALTIMORE, MARYLAND

NEW EQUIPMENT

Floodlight

New glass floodlight said to combine high reflectivity of silvered glass with unusual resistance to shock was designed

Type "L-49 Novalux" floodlighting projector; utilizes 300- or 500-watt lamps. **General Electric Co.**, Schenectady, N. Y.

to eliminate vital materials needed for war effort. Glass reflector is coated by electrolytically deposited metal, backed with porcelain enamel and joined to a metal socket housing. Unit is claimed to be corrosion-proof and from 10 to 30 percent more efficient than all-metal units it replaces.

•

Cutter-Retriever

Resembling a pistol, a cutter-retriever is designed to cut wire with one-finger operation, also to retrieve or to hold nuts, bolts, washers, cotter pins, etc., at inaccessible points. Cutting edges are actuated by a rod extended inside the pistol barrel from a trigger with a leverage ratio of 15:1.

"Long-Nose" cutter-retriever. **Pack-Rite Machine Corp.**, 828 North Broadway, Milwaukee, Wis.

Switch

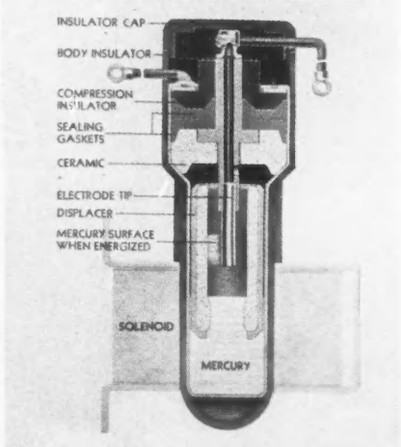
"Class 9390" thumb switch; single pole, double break; inductive rating 15 amp. at 24 volts, d.c. Weight 0.75 oz. Dimensions: 1 17/32 in. long, 7/8 in. wide at top flange. **Square D Co.**, 6060 Rivard St., Detroit, Mich.

Normally open switch of "thumb size" has round body and is provided with hexagon top flange, threaded throat and lock nut and washer for flush mounting on a panel or in a casting. Wiring is to two bottom terminals. Total button movement is 3/32 in., with first 3/32 in. for switch operation. Contact and release movements are snap action.

•

Relay

Mercury relay has tube of non-magnetic metal and insulated with molded plastic. Iron displacer lined with ceramic normally floats on mercury. When solenoid is energized displacer is pulled down, thus raising mercury level and bridging electrode to metal shell. Tungsten to mercury contact is made in hydrogen quenching atmosphere. Liquid and float are only moving parts.

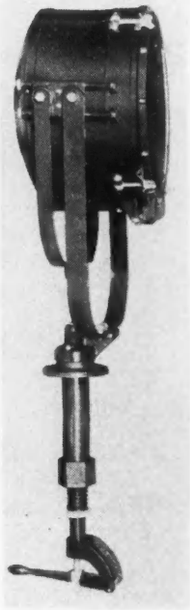


Type "BF" mercury relay; normally open or closed contacts. Contact capacities, 10, 30 and 75 amp., a.c. and d.c. operation. **Durakool, Inc.**, 1010 N. Main St., Elkhart, Ind.

BUYING ELECTRICAL EQUIPMENT?—McGraw-Hill's *Electrical Buyers Reference* is a convenient place to look first for manufacturers' product data, names and addresses.

Searchlight

For use at industrial plants, public utilities, ordnance plants and aboard ships, new searchlight with pilothouse control or flat base is equipped with locking handles for positioning at any fixed elevation and rotation. Beam concentration is obtained by a 19-in. parabolic silvered-glass reflector and a polished metal secondary reflector to permit continuous operation with an incandescent lamp. Tandem reflector shield in center of primary reflector is claimed to eliminate all secondary heat concentration on the lamp bulb.

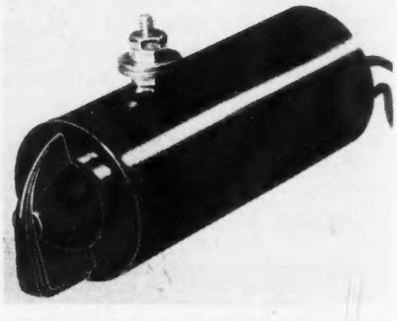


"18-in." incandescent searchlight; uses lamps up to 1,500 watts. Socket assembly, mogul bipost type rated 50 amp., 600 volts. **Westinghouse Lighting Division**, Cleveland, Ohio.

•

Auto Alarm

New electric alarm for installation on an automobile starts a car's horn blowing in short, successive blasts whenever the car is bumped or molested; designed to prevent theft of tires. It is claimed that alarm can be set for any degree of sensitivity—to operate when car is lightly moved or only by a considerable shock.



Electric auto alarm. **Kathanode Corporation**, St. Paul, Minn.

NEWS ABOUT PEOPLE

Duquesne Light Elects Ousler Vice-President

George W. Ousler has been elected vice-president in charge of sales, Duquesne Light Co., Pittsburgh, Pa. Mr. Ousler succeeds Joseph McKinley, who

retired June 1 after 39 years of service with the company.

A native of Boston, Mr. Ousler was graduated from the Massachusetts Institute of Technology in 1916 and immediately entered the service of the Philadelphia Company, Pittsburgh, in the engineering department. In 1927 he was made director of sales engineering and in 1929 manager of rates and retail service. In 1931 he was appointed general sales manager, which included supervision of the home service and rate departments, the position he held until his recent promotion.

•

▶ CHARLES L. DERRICK has been appointed assistant engineer of the Hartford (Conn.) Electric Light Co. Mr. Derrick entered the employ of the Public Service Electric & Gas Co., Newark, N. J., after being graduated in electrical engineering from Lehigh University in 1923. After three years in the company's cadet course, he became a staff member in the office of the transmission and substation engineer. Early in 1941 he was transferred to field operation, having general supervision over the construction and maintenance of underground and overhead lines in the Essex division, with headquarters at Irvington, N. J., the position he held before going to Hartford.

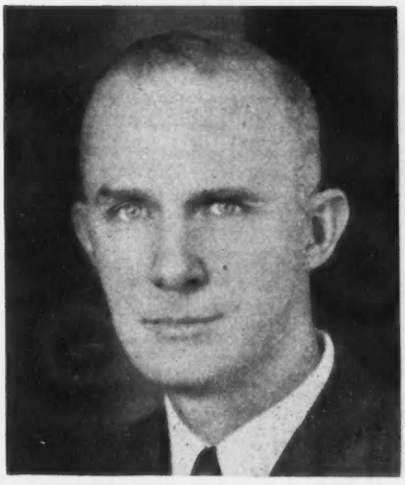
•

Virginia Utility Makes Executive Appointments

Three major shifts of Virginia Public Service Co. executive personnel has just been announced.

J. W. Howard, manager of the northern division, serving Alexandria, Leesburg, Warrenton and other communities, has been elected vice-president and manager of the eastern division. The eastern division covers the Peninsula area in and adjacent to Newport News.

G. E. Kidd, manager of the eastern division, will assume Mr. Howard's former duties as manager of the northern division, and, in addition, he will have supervision over the company's service in Arlington County which for-



G. E. Kidd

J. W. Howard

merly was under the direction of B. J. Dorsey. Mr. Dorsey will move to Newport News as assistant to Mr. Howard.

Three changes were occasioned by the resignation of F. A. Mitchell as vice-president of the company with headquarters in Newport News. Mr. Mitchell resigned to become president of the Newport News Distilled Ice Co.

•

▶ CHARLES E. WILSON, president of the General Electric Co., has been named chairman of the electrical industries division of the War Production Fund to Conserve Man-power. In his capacity as chairman of the division, Mr. Wilson will organize and lead the drive in the electrical industry to obtain the funds with which the mounting trend of accidents in war-production plants may be curtailed.

▶ ABE FORTAS, director of the Interior Department's power division, has been nominated by President Roosevelt to be Under Secretary of the Interior. He would succeed John J. Dempsey, whose resignation has been accepted by the President. Once an assistant director of SEC's utilities division, Mr. Fortas

● A clever saboteur might elude the most alert guard—but he couldn't escape the constant watchfulness of a Schaub MAGNETROL Low Oil Level Alarm. The instant that transformer oil level reaches the danger point, the MAGNETROL rings an alarm bell to warn the operator of trouble—in time to prevent costly damage to invaluable equipment.

Especially now, with the Nation's war effort so dependent on an uninterrupted flow of power, Magnetrol protection is indispensable. Incorporating the time-proved Schaub magnetic operating principle, this alarm is thoroughly dependable. Without bellows, packing box, electrodes or diaphragms to get out of order, it gives positive protection against the danger of low oil levels whether caused by treachery, carelessness or mechanical trouble.

Install one on every oil-filled transformer as part of your program to "Keep Power Flowing." The cost is insignificant, compared to the value of the equipment protected. Write today for full data.

GREEN LIGHT— *All's Well*

Normal oil level is indicated by a constantly glowing green light. If the circuit is interrupted or oil level drops for any reason, the MAGNETROL switch extinguishes the light, giving the operator a VISUAL sign of trouble.

BELL RINGS— *Danger Threatens*

To make doubly sure of the operator's attention, low oil level also rings a warning bell to provide AUDIBLE signal. The bell continues to ring until the warning is heard and the trouble is corrected. At unsupervised stations, the MAGNETROL can be wired to interrupt the pilot circuit on the breaker, to give positive assurance against damaged equipment.

FRED H. SCHAUB ENGINEERING CO., INC.
329 W. Huron Street, Chicago, Illinois

was in the general counsel's office for the National Power Policy Committee and for PWA and later served as counsel for the Bituminous Coal Division.

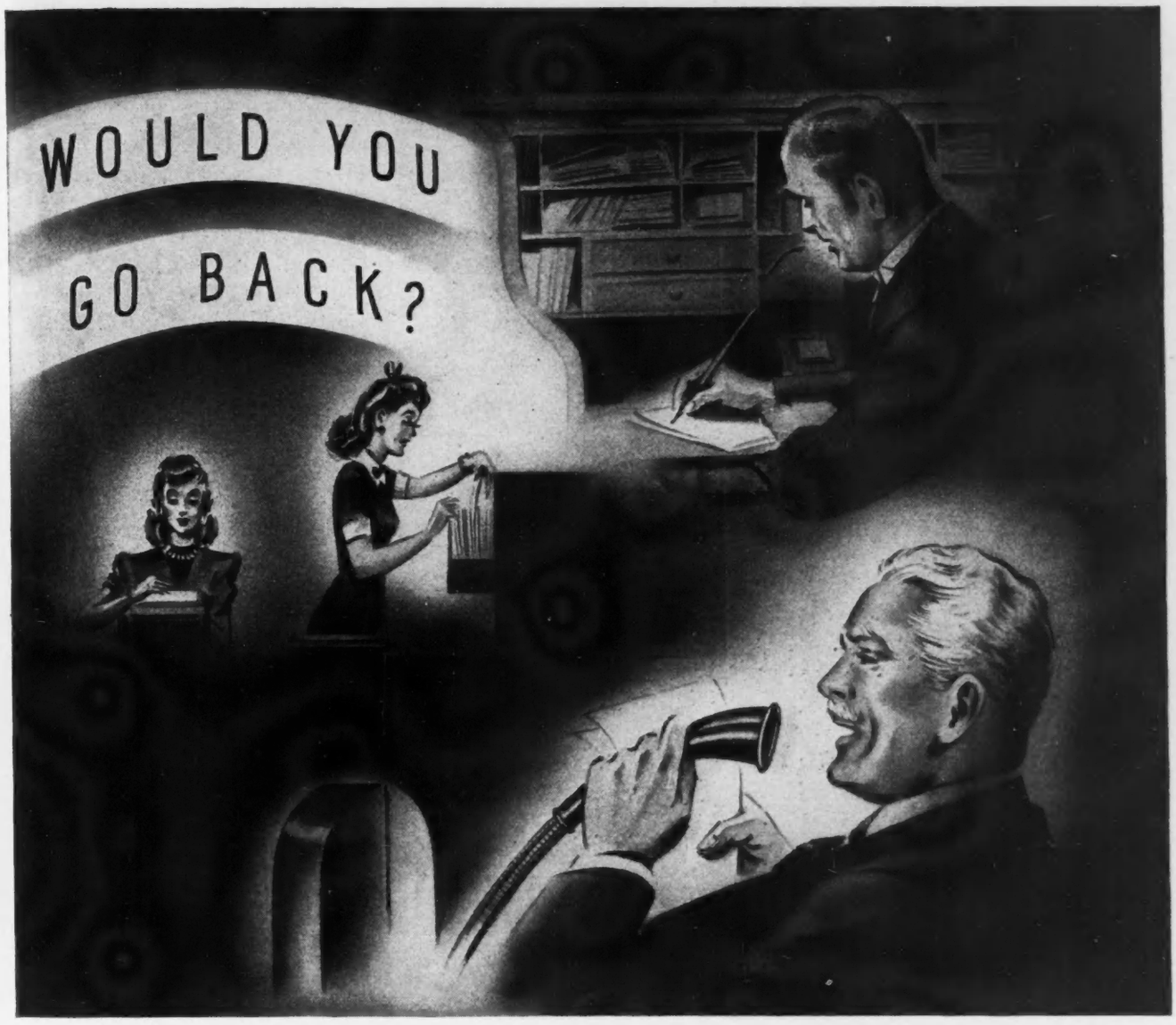
▶ VINCENT C. BRENNAN has been appointed executive director of personnel of the Union Electric Co., St. Louis, Mo. Mr. Brennan was formerly connected with the eastern division of the Tidewater Association Oil Co. of Bayonne, N. J., where he was in charge of industrial relations. He has served as a member of the panel of the training within industry group of WPB at Newark, N. J.

▶ OTTO CRUTCHFIELD, assistant lighting engineer, has been appointed sales manager of the central division of the Oklahoma Gas & Electric Co., to succeed the late F. P. Hays. Mr. Crutchfield began his career with the company as appliance salesman at Bristow many years ago.

▶ ANDREW J. HOFFMAN, for the past seven years construction engineer for the Public Service Commission of the state of New York, has resigned to join the staff of Ebasco Services, Inc., New York. Mr. Hoffman was formerly a construction officer for the United States Army and general superintendent of construction for the department of plant and structures, New York City. Prior to that time he was vice-president of the Seaboard Ice Co., executive manager of the Consolidated Gas Co. of New Jersey and district engineer for the Public Service Co. of Northern Illinois.

▶ JOSEPH W. HICKS has opened an office as public relations-industrial relations counsel with headquarters at 333 North Michigan Avenue, Chicago, Ill. For many years Mr. Hicks was connected with the Byllesby Engineering & Management Corp. and later with the Public Utility Engineering & Service Corp., Chicago., as publicity director.

▶ WILLIAM W. SPROUL, JR., has been appointed manager of the newly-formed transformer equipment sales section at the Sharon Works of the Westinghouse Electric & Manufacturing Co. The distribution and instruments sales sections of the transformer division have been combined into a single new unit with ROBERT D. RUNG as manager. Mr. Sproul joined Westinghouse in 1927. After five years in the transformer sales department at Sharon, he spent two years touring the eastern half of the United States introducing the company's new CSP distribution transformer. From 1937 until his present appointment, Mr. Sproul was in the power transformer sales department where he was closely associated with the development of the Westinghouse



A BETTERMENT . . .

Not a Substitute

The modern dictating machine is not a substitute for the handwritten "copying ink" letter of the last century.

It is a BETTERMENT.

What executive could afford to go back to handwriting his own letters? His competitors would soon outstrip him if he even dared try it.

Neither will forward-looking designers and engineers want to go back to habitually used, now hard-to-get, weighty, corrosive, costly materials. These men are discovering that CONTINENTAL-DIAMOND NON-metallics offer unique property combinations that make possible betterment of product, process and performance.

They have made such discoveries by bringing their "What Material?" problems to the C-D Research Laboratory. With FIVE C-D NON-metallic materials to use . . . with over 27 years of "know how" to draw upon . . . and free from any prejudice favoring one or two types of NON-metallics, the C-D Laboratory is usually able to work out an answer to most problems that definitely results in a BETTERMENT.

You can get acquainted with C-D NON-metallics through our Booklet GF-12. When you want Laboratory Research assistance . . . it's yours for the asking.

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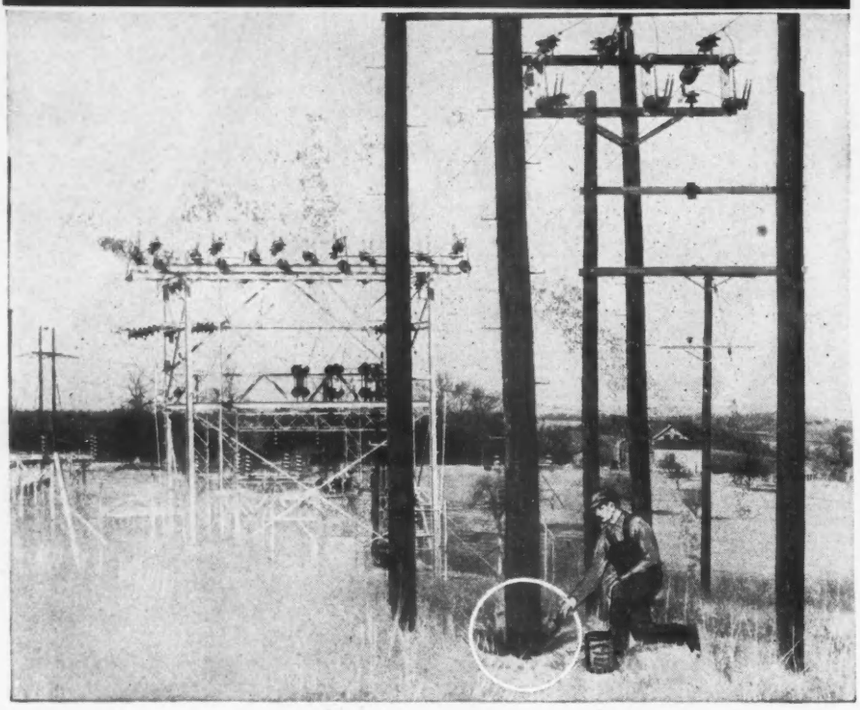

Osmoplastic Groundline Treatment

keeps poles standing longer thereby reducing replacements and possible power failures

All out war production work calls for uninterrupted power service. You can guard against possible power shut-offs due to pole failures at the groundline by using the Osmoplastic groundline treatment. This easy to use yet highly effective treatment, applied at the groundline, increases the service life of untreated or "B" treated standing poles many additional years thus reducing costly replacements. And because Osmoplastic retards groundline decay, frequent pole inspections are eliminated. Actual service records of over 60 leading utilities prove that the Osmoplastic groundline treatment saves money by increasing standing pole life 7 years or more. Make Inspection time Osmoplastic protection time.

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The new fully illustrated descriptive Bulletin 242-E showing the uses and advantages of Osmoplastic groundline treatment will be sent on request.

mobile power substations. Mr. Rung joined Westinghouse in 1917 as a transformer assemblyman at the company's East Pittsburgh, Pa., works. After a few months he was transferred to the clerical engineering department where he remained for eight years. In 1925 he went to Sharon to take charge of renewal parts engineering, a position he held for 12 years. He then was made supervisor of renewal parts sales, and last year was appointed manager of the instrument transformer sales section.

► PROF. H. B. WALKER, head of the agricultural engineering division of the University of California College of Agriculture and chairman of the California Committee on the Relation of Electricity to Agriculture, has been elected president of the American Society of Agricultural Engineers.

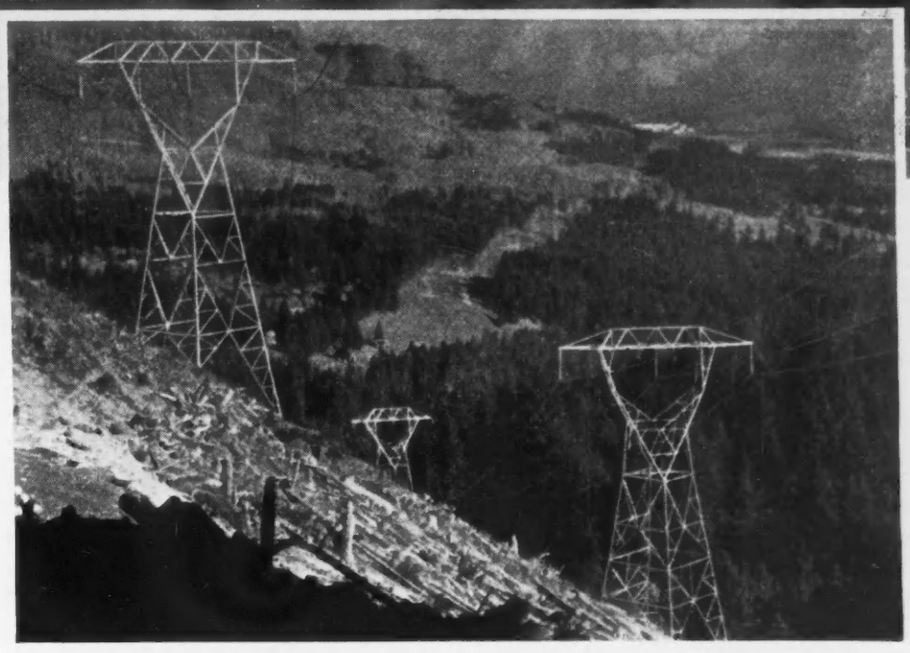
► FRANK H. WOODWARD, a veteran of the public utility business in California, will retire on July 1. Since 1894 he has been connected with the public utilities of the San Francisco Bay region. Up to the time of its purchase by Pacific Gas & Electric Co. he was sales manager for Great Western Power Co. and during recent years has been in the sales department of the East Bay division.

► VINCENT D. NICHOLSON has been appointed deputy administrator of the Rural Electrification Administration. A pioneer in the rural electrification movement, Mr. Nicholson served as general counsel of the REA from its establishment in 1935 until about a year ago, when the legal division serving REA was merged with the office of the solicitor in the Department of Agriculture. Since that time he has served as associate solicitor in charge of the rural electrification division of the solicitor's office. In his capacity as deputy administrator Mr. Nicholson will have charge of the Washington office of the REA. He will continue as associate solicitor in charge of REA legal work.

► J. K. B. HARE, manager of the central district of the Westinghouse Electric & Manufacturing Co., was recently made the recipient of the Westinghouse Order of Merit for distinguished service. Mr. Hare was cited "for his excellent management of the central district in constructive co-operation with headquarters personnel and for his successful administration of diverse sales activity in the major industrial areas of his district."

► EARL H. EACKER, electrical engineer of the Charlestown electric division of the Boston Consolidated Gas Co., and assistant to the president since 1937, has been elected vice-president in charge of the electrical division and investigation department. In the president's absence he will exercise the du-

HELPING TO PUT POWER RESOURCES TO WORK FOR WAR PRODUCTION



AMERICA is fortunate to have entered this war with so many key power projects complete or near-complete. Throughout the nation, as gigantic new war plants have sprung from open fields, production has been sparked into swift activity by a ready source of electrical energy. Whatever the source of power—whether steam or hydraulic—the important thing is it's *ready* to help industry equip and maintain a victorious fighting force.

Fabricated steel structures built by American Bridge are helping to put power resources to work for war production.

Hundreds of steel gates of all types —tainter, rolling, lift and swing—are impounding the waters of many rivers. They harness the flow to control floods, extend navigation to upper reaches, and generate electrical energy.

Thousands of steel towers dot the continent, carrying power lines that radiate from sources of energy to industrial communities and to essential war industries that have mushroomed throughout all sections of the nation. These transmission towers were designed to carry heavy-duty power lines under extreme climatic conditions and to traverse every imaginable type of terrain — deserts, valleys, plains and mountains. Their efficiency has been tested by subjecting full-size "pilot" towers to duplicated field loading conditions in our Test Frame, the largest in the country.

Just as many of the projects we have completed in recent years are serving the war effort in various ways, now all of our resources of equipment, engineering talent, and specialized "know how" are active in projects directly essential to war.

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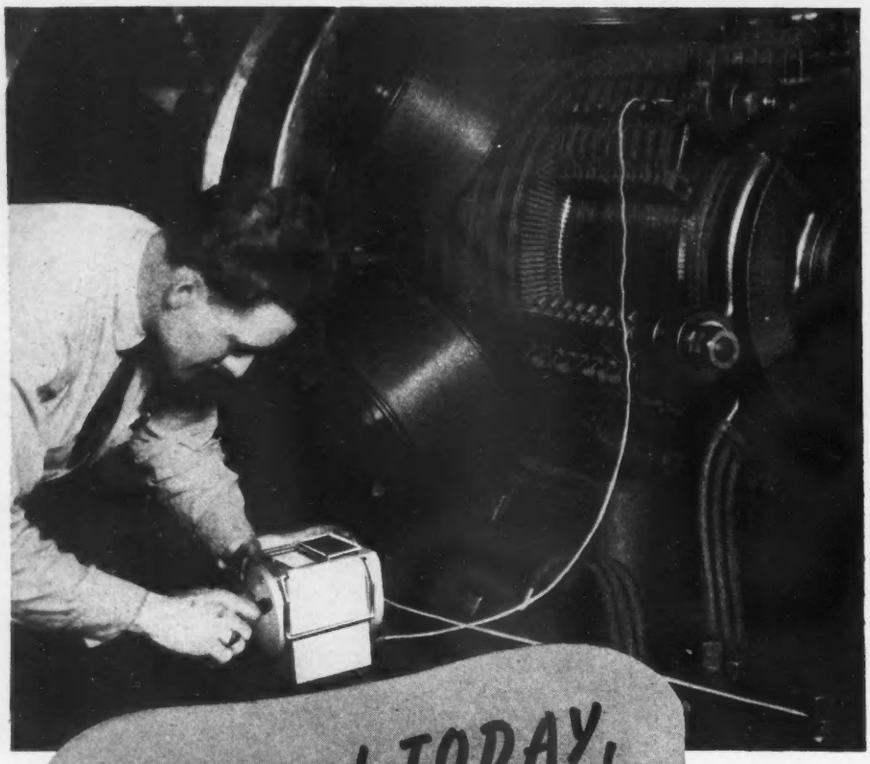
UNITED STATES STEEL

TAKE TIME TO TEST . . . *and* SAVE *TIME*



. . . and TODAY, TIME is priceless

Although "Megger" Insulation Testers have been used for years by industry to detect and forestall electrical breakdowns, their use today has assumed an importance out of all proportion to the cost of the instrument—or the amount of time spent in using it. It is not merely a matter of dollars and cents. Production time is priceless . . . and electrical equipment is most difficult to replace. *Minutes* with a "Megger" Tester can save *Days* of delay.

Under the stress of present demands, everyone who is directly or indirectly responsible for keeping motors, generators, wiring and other electrical equipment in good operating condition, should be fully acquainted with the advantages to be gained by the use of a "Megger" Tester. Write us for a free copy of the Pocket Manual of "Megger" Practice No. 1420-W.

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ties of the chief executive. The Charlestown property is a distributing electric and gas utility serving the northern part of Boston proper under B.C.G. management.

▶ FREDERICK X. KAIER, supervisor of sales analysis since 1931, has been appointed assistant to the vice-president in charge of sales of the Philadelphia Electric Co. Mr. Kaier studied mechanical engineering at Pennsylvania State College and was first employed by the Philadelphia Electric Co. in 1922 as a station inspector. Subsequently he was transferred to the sales department and was made supervisor of market analyzers.

▶ KEITH B. EDWARDS, manager of the Bloomfield district of the Public Service Co. of Indiana for the past five years, has been appointed manager of the newly created Greensburg district, comprising the utility properties of the former Hoosier Public Utility Co., which was purchased by Public Service Co. of Indiana recently. Mr. Edwards has been succeeded as manager at Bloomfield by JOHN R. DOWD, formerly sales supervisor of the Vincennes district.

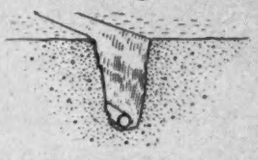
▶ HARRY C. BEAVER, president of the Worthington Pump & Machinery Corp., has been elected president of the Worthington-Gamon Meter Co. to succeed the late E. T. Fishwick. R. R. ANDERSON, treasurer and manager of the company, has been made vice-president and director and will retain his office as treasurer.

▶ PAUL WASSMANSDORF has been appointed advertising manager of the General Electric appliance and merchandise department's plastics division at Pittsfield, Mass. W. D. HAYLON, who until recently was manager of plastics division advertising, is now with the U. S. armed forces. Mr. Wassmansdorf is being transferred from the appliance and merchandise department's advertising division in Bridgeport, Conn., where he has been assistant to H. R. Smith, advertising supervisor for heating devices, fans, clocks and sunlamps. His experience with General Electric covers six years.

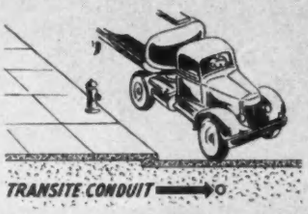
▶ S. J. MCKELVY has been appointed head of the engineering division of the underground and transmission construction department just formed by the Public Service Electric & Gas Co., Newark, N. J., through the merger of the engineering sections of the underground division and of the transmission division. The headquarters section of the department has been discontinued and the transportation and the stores groups of that section assigned to the underground division under A. F. Randolph, underground construction engineer. The

DO YOU KNOW THESE FACTS ABOUT TRANSITE DUCTS?

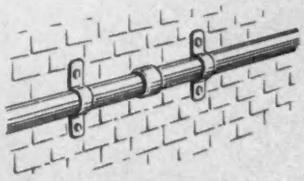
TRANSITE CONDUIT



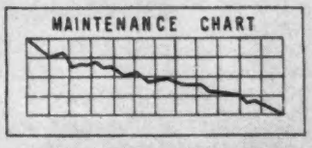
This durable duct is for use underground, or on exposed locations without a protective casing . . .



Under sustained earth loads and traffic pressure, it maintains its strength and true form . . .



Transite Conduit effectively resists weather, smoke and fumes...is virtually unaffected by corrosive soils...



Its cost is low and, in service, it is much more economical than other materials of comparable strength and durability.

. . . In addition, both Transite Conduit and Transite Korduct have these characteristics . . .

1. Incombustible—Made of asbestos and cement, they cannot burn . . . will not contribute to the formation of dangerous smoke, fumes or gases.

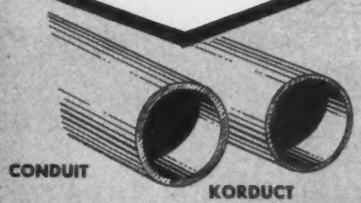
2. Immune to electrolysis . . .Transite Ducts are non-metallic and inorganic . . . unaffected by electrolysis.

3. Smooth bore—Making cable pulls easier, both at initial installation and after years of service.

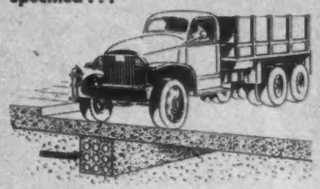
4. Easily installed—Lining up is fast and accurate because Transite Ducts combine light weight, long lengths, simple assembly.

For details and specifications, write for Data Book DS-410. Johns-Manville, 22 E. 40th St., New York.

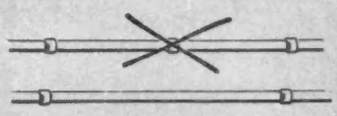
TRANSITE KORDUCT



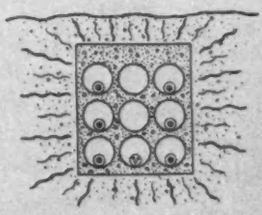
Thinner walled, lower priced than Transite Conduit, Transite Korduct is for use where an encasement is specified . . .



Because Korduct is incombustible, less concrete is required between ducts to provide the necessary degree of fire protection.



Its long lengths (10 feet) mean fewer joints, reducing the number of spacers required . . .



Its high rate of heat dissipation lowers cable operating temperatures . . . increases system capacity . . .

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TRANSITE KORDUCT— for installation in concrete

TRANSITE CONDUIT— for exposed work and installation underground without a concrete encasement

NEW Exclusive

Sag Guide on FARGO LINE SPLICE shows you where to cut wire!

Another Fargo "first", new Sag Guide markings on the Fargo Line Splice show exactly how much conductor goes inside the splice. Result . . . you know exactly where to cut the wire to get the desired sag. Saves guessing, saves time.

And how that Fargo Splice *holds!* 4-jaw gripping unit of machined non-corrosive Everdur develops full conductor strength. Heavy, *all copper* shell of highest conductivity. Strong phosphor bronze spring. Full range of sizes. Specify FARGO, "the sure splice".

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shop group has been assigned to the transmission construction division, under Fred H. Legge, transmission construction engineer.

OBITUARY

▶ ARNOLD W. RIDLEY, until recently manager of the Denver steam plant of Public Service Co. of Colorado, died in April, following an illness of several months. His service record dated from 1891, when he started work at the plant his father helped to build for the old Denver Gas & Electric Co., later consolidated with Public Service Co. He was a native of England and was 72 years old.

▶ OSCAR A. KOMMERS, manager of Pacific Gas & Electric Co.'s Taft district for more than 23 years, died on April 10, following a long illness. Mr. Kommers was born in Wisconsin in 1891 and joined Pacific Gas in the Madera district in 1912.

▶ ROBERT M. TOWNSEND, property agent of the Portland General Electric Co., Portland, Ore., died, of a heart attack, on June 10, in his seventy-third year. Mr. Townsend, who began working for the company's predecessor in 1888, was awarded a fifty-year service pin in 1939 at a ceremony held in his honor.

▶ WILLIAM E. SHERWOOD, 53, organizer and president of the Island Light & Power Co., Block Island, R. I., died at his home in that place on June 16. He was born in Norwood, R. I., and before establishing the Island company was manager of the Providence branch of the Petroleum Heat & Power Co. With Joseph Pennington, Mr. Sherwood set up the Island utility in 1925, serving 25 customers from 1 mile of line during the first season, and later developing 24-hour service for virtually the entire island.

▶ RALPH W. EATON, 62, public service engineer of the city of Providence, R. I., died suddenly at his summer home in Bristol Highlands, R. I., June 1. He was born at Hill, N. H., and was graduated in electrical engineering from the Massachusetts Institute of Technology in 1903. After eight years with the Westinghouse company he became electrical engineer for the Connecticut Co. and Housatonic Power Co., later serving as electrical and mechanical engineer for the Shore Line Electric Railway of that state. In 1918 he received his Providence appointment and was widely known for his work in the field of safety engineering, traffic accident prevention, smoke inspection and wiring codification. Mr. Eaton was a past president of the Providence Engineering Society.

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WILL REVEAL NEW TRANSFORMER HORIZONS

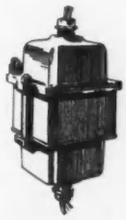
War-born improvements in design and construction will bring you even better AMERTRAN Products . . .

AmerTran is in the thick of the fight now, on war production . . . and under the stress we are developing improvements that we cannot now reveal. But some day the complete story will be told . . . and the better transformers we are shipping to those with priorities today, for wartime production, will be available for all to use. Improved designs and manufacturing methods, born under the spur of necessity—will bring you even better AmerTran products than those you know now . . . will still further confirm the leadership that AmerTran has gained and held during the past 41 years in the electrical field, in industrial and utility applications. While the war lasts—plan ahead! Plan for the peace boom with AmerTran improved transformers.

AMER TRAN

AmerTran power transformers available for all requirements in sizes to 10,000 KVA, 132 KV.

AmerTran distribution transformers of either oil- or noninflammable-liquid-immersed type available in sizes to 500 KVA., 72 KV.



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AmerTran transformers are manufactured to meet your exact electrical and mechanical requirements for all applications, and in sizes up to 10,000 Kva.

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Prime Movers
Power Plant Economics
Power System Electrical Equipment
Power Transmission
Power Distribution
Wiring Design—Commercial and Industrial Buildings
Illumination
Industrial Power Applications
Electric Heating and Welding
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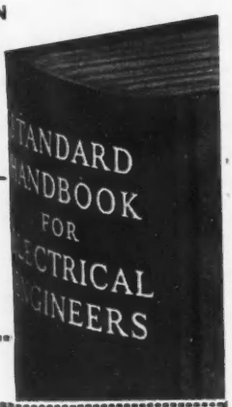

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Recent Rate Changes

PENNSYLVANIA POWER & LIGHT CO. has been authorized by the state Public Utility Commission to put into effect three revised schedules of rates affecting large commercial and industrial consumers with demands of 25 or more kilowatts, who did not begin to take service from the company until on or after April 4, 1942. The affected schedules are designed GLP-3, GLP-4 and GLP-5. The rate schedules replace three others filed by the utility in April, containing tax and fuel clauses and providing no off-peak use benefits. The commission suspended the earlier schedules, whereupon the company withdrew them and filed the new ones.

CENTRAL HUDSON GAS & ELECTRIC CORP. has filed revised rate schedules with the state Public Service Commission, which will result in a net saving of more than $29,000 per annum for electric and gas customers. The total reductions principally in the commercial and industrial classifications and to rural customers will amount to $56,000. There will, however, be increases of approximately $26,700 resulting from the elimination of estimated demands in the commercial and industrial classifications and from an increased charge for commercial heating service which will leave an estimated reduction in the company's annual revenue of $29,300 annually. Elimination of the estimated demand for commercial and industrial users will greatly simplify the rate structure in these classifications. About 1,700 rural customers will benefit from the changes as a result of modification of the company's minimum monthly line extension charges. The changes affecting rural customers may be summarized as follows: On lines less than 5 years old the minimum charges of less than $3 per month will be eliminated. Where the minimum charges are from $3 to $6 per month the charge will be $3. Minimum charges of more than $6 will be reduced approximately $3. On lines over 5 years old minimum charges of $6 and less will be eliminated and minimum charges over $6 will be reduced by approximately $3.

GEORGIA POWER'S Co's lower rate scale for power consumers, which was scheduled to go into effect on June 1, has been "temporarily" postponed by the state Public Service Commission. The present schedule will continue "pending further study." Chairman Walter R. McDonald explained that under a 1939 commission order a promotional rate, giving consumers a chance to earn a lower rate by increased usage of electricity, was to become the regular base rate on June 1 this year. Asserting that so far only 58 percent of the company's customers have earned the reduced rate, the commission said that extension of this promotional schedule now to all the other customers would place "an abnormal burden" on the utility and "one which its present revenues do not appear to justify." The commission pointed out that higher operating costs and taxes cut heavily into the company's earnings last year and added that, because of wartime limitations on sales and construction, the company could not increase sales sufficiently to offset a new burden.

BARRON, WIS., municipal electric plant has been authorized by the Wisconsin Public Service Commission to put into effect on August 1 new rates which will mean a saving of $7,000 a year.

Hot Rolled Copper Rods

Bare and Tinned Copper Wire (in rounds, flats and squares)

Bare and Tinned Strand

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MANUFACTURING-MARKETS

Labor-Management Plants Total 900

Establishment of labor-management committees in ten General Electric plants brings to 900 the number of plants participating in the war production drive, it was announced at WPB drive headquarters.

Coincident with the rise in the number of plants with war production drives, a large number of increases in production have been reported by labor-management committees recently.

The committee in the East Pittsburgh plant of Westinghouse reported that shipments in the terms of carloads reached a new high for the month of May, exceeding the April high by 55 carloads.

In the New Haven, Conn., plant of the American Steel & Wire Co. of New Jersey six production records were broken during the first five months of 1942, against five records for the entire year of 1941. The committee in the Donora, Pa., works of American Steel reported that "since the inauguration of the committee and the start of the production drive on April 1 a total of eight records were broken.

Westinghouse Electric Elevator Co., Jersey City, N. J., reports that the plant is 36 percent above its production quota.

•

Hygrade Sylvania Cuts Use of Mercury 50%

A saving of approximately 50 percent in the amount of mercury used in the manufacture of fluorescent lamps has been announced by the Hygrade Sylvania Corp.

The saving is effected by a new manufacturing method developed since the war, on which a patent has been granted. The new process both saves mercury and produces improved lamp performance as well.

Basis of this process is a mercury "bomb" which is expoded in the interior of the lamp during manufacture, ejecting the exact amount of mercury needed and eliminating the wastage resulting from previous methods.

•

New Westinghouse Maintenance Program

A new maintenance program, stressing fewer, shorter and longer-lasting repairs, has been set up by the Westinghouse Electric & Manufacturing Co. to help keep present facilities in industrial plants and central station plants at peak production, according to H. R. Meyer, manager, maintenance sales section.

The program calls for regular customer contacts for the purpose of making necessary inspections, inventories, field service and repairs. In addition, maintenance sales engineers will be available to help determine renewal parts requirements and to assist in setting up an electrical apparatus system when conditions warrant. On request, recommendations on specific electrical problems will be made. To keep machines running a schedule will be made of repair work to be done in Westinghouse service plants.

Anticipating the need for a well-organized customer maintenance program, Westinghouse set up a maintenance sales department in December, 1941, consisting of special groups in district sales offices to make sure renewal parts are provided to take care of maintenance work. Emphasis was placed on quick action in breakdowns

THE MEN BEHIND THE WESTINGHOUSE MAINTENANCE PROGRAM—Standing are J. R. Van Ryn, supervisor, renewal parts division, switchgear sales, and E. N. Fabrizio, renewal parts, motor division. Seated, l. to r.—C. A. Butcher, assistant manager, district manufacturing and repair; H. R. Meyer, manager, maintenance sales; M. B. Wyman, manager, district engineering and service, and R. L. Kirkpatrick, manager, renewal parts section, transportation and generator division

P.S. The fifth reason is "mobilized information"

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If a factory in Kansas succeeds in laying the dust and stopping ruts in its parking lot, an engineer with the job of quick-surfacing a jungle airport reads how it was done in a construction magazine.

If a shipbuilder finds he can cut construction time in half by building hulls upside down, other shipbuilders learn about it from their technical magazines.

At McGraw-Hill alone 153 editors and 725 field-correspondents are constantly combing construction as well as industrial jobs to find new and faster methods. This "know-how" is then routed through industrial magazines to every industry where it can be helpful.

In addition to the editors, many industrial advertisers keep men in the construction field to watch the performance of their machines. Their reports are used in industrial advertising to show operators how to make machines do more work and last longer in these days of shortages of time and metal.

. . . Now this advertisement contains a moral and "commercial." The commercial objective is obvious. The moral is this:

▶ Let's remember how well government, management and labor are getting along together in the face of visible peril. When the war is all over, we need have no fear of the invisible perils of peace, if we tackle our jobs in the same cooperative spirit.

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Engineering News-Record
Factory Management & Maintenance
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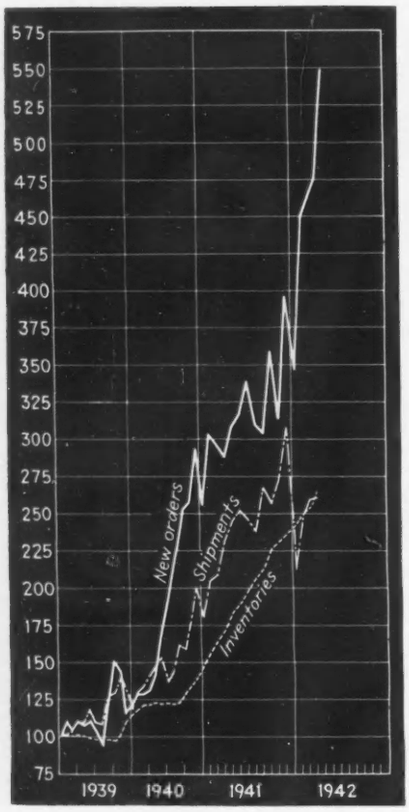
Mill Supplies
Power
Product Engineering
Textile World
Transit Journal
Wholesaler's Salesman

to get the machine back on the line. At headquarters another group sees to it that the districts are supplied with information to speed the job of obtaining new parts and material for repair work.

•

Electric Orders Hit New High in April

New orders for electrical machinery during the month of April reached a new high, the index of value of new orders received by manufacturers, compiled by the Bureau of Foreign and Domestic Commerce, advancing to 549



ELECTRICAL MACHINERY INDICES of Bureau of Foreign and Domestic Commerce

from 477 in March. This index stood at 288 in April, 1941. Orders for durable goods generally held at the extremely high volumes established in recent months.

Index of the value of electrical machinery manufacturers' shipment advanced slightly from 257 in March to 259 in April and 249 in February. The department's index of total shipments has remained unchanged at 199 percent of the 1939 average for the third consecutive month.

Rising 8.7 points from the March figure, the index of the value of electrical machinery manufacturers' inventories reached 264.2 in April, compared with 172.9 in April.

Field Reports on Business

Demand for electrical equipment continues at high levels to meet the requirements of the expanding war production program. Backlogs in some factories are being lowered under full-time production. After several weeks of declining activity, there was some indication of a break in civilian buying apathy.

NEW YORK

Compliance with the General Maximum Price Regulation is encouraging OPA reports, but retailers seem to be lagging on the posting and record-keeping aspects of the order. Some two-thirds of the retailers surveyed have either incomplete records or seem to have no understanding of the fact that listings of the price ceilings must be made. A program of education is scheduled, OPA officials said.

Department store sales for the week showed a 3 percent drop from the figures of the corresponding week in 1941, Federal Reserve Board officials pointed out in their weekly summary of retail sales. Census Bureau figures for May showed a 4 percent drop in sales of independent retailers, over May of last year. This was the first time in 42 months that sales have been less than in a corresponding month of the year before.

Engineering construction volume for the week totaled $155,670,000, a decrease of 59 percent from the preceding week and 10 percent under the total for the corresponding 1941 week, according to *Engineering News-Record*. Public construction, which accounts for 93 percent of the total, is 61 percent below last week and 7 percent below last year. Private work tops the preceding week's total volume by 91 percent, however, but is 40 percent below a year ago.

NEW ENGLAND

Government awards to manufacturers in this area continue in good volume. Factory expansion and new construction are beginning to taper off. To date, about 10,000 kva. in capacitors have been installed in one Connecticut war plant area since 1929 and 2,500 kva. in additional units are now under way, with prospects of 2,500 kva. more before 1943. Negotiations for several small substations in connection with new war plants planned for this area are being pushed. Electric furnace manufacturers are booked up for the remainder of the year and with the advantage of high priorities are rushing work on heavy-duty furnaces for both foreign and domestic locations. Installations of infra-red units are progressing. Inquiries for special processing units rated as high as 100 kw. are being received by one manufacturer, who reports encouraging results in adapting infra-red applications in many operations which involve non-metallic materials.

Electric cable manufacturers have negotiated contracts for cable amounting to over $1,500,000 during the past month. Extensions to water supply systems in a number of municipalities are being urged for immediate action due to the sudden increase in population as a result of war work.

Bids will be open this month for 1,500 permanent units for housing war workers at Portland, Me. A large Connecticut office building is being equipped with about 400 semi-direct and 300- and 500-watt lamps. Awards to New England non-ferrous products manufacturers have taken a slight spurt upward and should stimulate interest in electrical equipment and supplies in that field. Textile mills are operating at a steady rate. The backlogs in many mills and factories among New England's diversified industries are being lowered under full-time production.

PACIFIC COAST

Pacific Gas & Electric Co. is making no retrenchment in its advertising, which will be under three heads: patriotic, institutional and the "durationizing" of appliances. Final factory shipments of small appliances are being received, though dealers and department stores report an unpredicted maintenance of volume.

Wholesalers report occasional large orders for refrigerators and ranges for scattered defense housing, usually in remote areas, but carrying good priority. Farm electrical business has been very good.

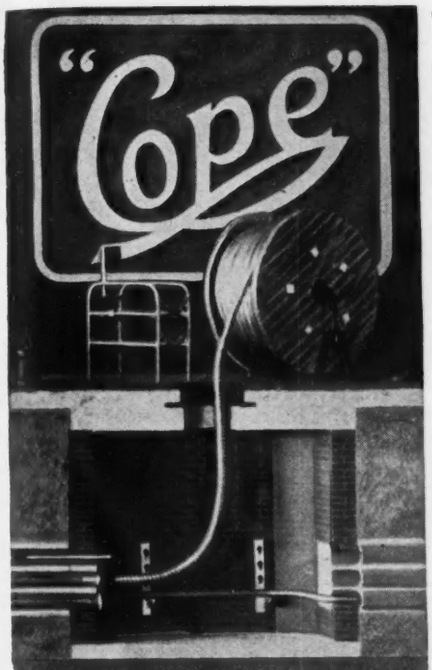
Orders are topped by Boise project awards of $253,260 to Westinghouse for generators and $265,122 to Leffel for turbines and generators. Other orders cover 125,000 ft. of fibre conduit with fittings and $13,506 of Okonite cable for Bonneville system; special service extensions to a new group of air warning stations; $102,000 structural steel for Coulee 230-kv. switchyard; 1,200 ¼-hp. motors for pumping outfits; $70,000 welding cable for a Bay shipyard; twelve 500-kw. Pyranol transformers and accessories costing $32,000 for a navy drydock job; $37,000 cable for an Hawaiian Island repair yard, and $60,000 switchgear for Pearl Harbor. General Electric submitted the low bid of $2,487,000 for five 45,000-kva. generators for Davis plant near Arizona border.

CHICAGO

The demand for industrial electrical equipment continues at high levels to meet the requirements of the expanding war production program. With the output of armament material being rapidly increased, the matter of deliveries is becoming a more important factor. One company lost a $1,000,000 naval order for control apparatus because of inability to make delivery in less than four months.

The large number of new plants and plant additions under construction in this area is also creating a heavy demand for electrical equipment. Priority ratings are being raised continually in order to direct equipment into the more important war work. As a result many orders have to be delayed or canceled entirely.

Bids are being taken on the electrical work for the Illinois Institute of Technology metallurgy building. Carrying an A-1-J priority rating, the specifications include transformers, secondary feeders, high-voltage ducts, light and power feeders and distribution panels, setting and connecting motors, telephone conduit system and a $6,000 allowance for lighting fixtures. J. Livingston & Co. was awarded a contract for installing overhead cranes and two electric furnaces at one of the steel mills. Bids are being requested on emergency turbogenerators for the Amertorp Corp. plant now under construction. Hatfield Electric Co. was awarded the electrical contract on the Studebaker plant extension in Lake County, Ind., costing between one and five million dollars.



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Sales Opportunities

WASHINGTON—Puget Sound Power & Light Co., Seattle, will make extensions in transmission lines for service at military site in Pacific Northwest, where terminal power substation will be located. Also will install local distribution system for power and light supply. Entire project will cost about $1,000,000.

CALIFORNIA—War Department, Washington, D. C., plans power substation facilities and electric power equipment in new depot warehouse in California, estimated to cost over $3,000,000. Work will begin soon under direction of U. S. District Engineer Office, Sacramento.

OHIO—National Lead Co., 111 Broadway, New York, N. Y., will begin work at once on new multi-unit plant in Ohio for production of metallic magnesium. A power substation will be built. Cost over $5,000,000, with financing through Defense Plant Corporation. United Engineers & Constructors, Inc., 1401 Arch Street, Philadelphia, Pa., is engineer in charge of design and erection.

FLORIDA—U. S. Engineer Office, Jacksonville, will receive bids (no closing date stated) for installation of basic lighting system on site in Florida.

WISCONSIN—Wisconsin Power & Light Co., Madison, has made application for priority rating for proposed expansion in steam-electric generating station at Beloit, including new steel frame structure, with installation of turbine-generator unit, high-pressure boiler and accessories. Cost estimated about $2,550,000. Sargent & Lundy, Inc., 140 South Dearborn Street, Chicago, Ill., is consulting engineer.

NORTH CAROLINA—War Department, Washington, D. C., has authorized construction of new air force training school in Raleigh-Durham area. Complete electrical equipment and facilities will be installed for industrial, airfield and residential service. A power substation will be built. Cost estimated over $3,000,000. Deitrick & Olsen, Raleigh, are architects and engineers. U. S. District Engineer Office, Wilmington, N. C., will supervise project.

MAINE—Casco Bay Light & Water Co., Portland, plans new power plant, using diesel engine-driven generator unit and auxiliary equipment, supplementing present station. Also will make extensions in transmission and distributing lines.

NEW YORK—Curtiss-Wright Corp., Airplane Division, Kenmore Avenue and Vulcan Street, Buffalo, plans new multi-unit plant for parts production and assembling for large-type cargo aircraft. Cost about $10,000,000, with financing through Defense Plant Corporation. Work is scheduled to begin soon. William Davey is general manager. Main offices at 30 Rockefeller Plaza, New York.

COLORADO—Chemical Warfare Service, War Department, Edgewood Arsenal, Edgewood, Md., has authorized new chemical-manufacturing works in Colorado, comprising several large production units. A power substation is planned. Entire project will cost about $5,000,000. Whitman, Requardt & Smith, 1304 St. Paul Street, Baltimore, Md., are consulting engineers. U. S. District Engineer Office, Denver, will supervise project.

OHIO—War Department, Washington, D. C., plans electric power equipment in new depot warehouse in Ohio, with power substation, light and power system and

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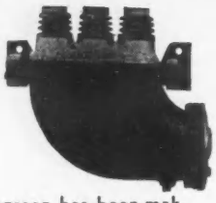

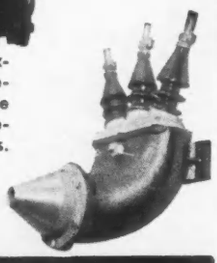

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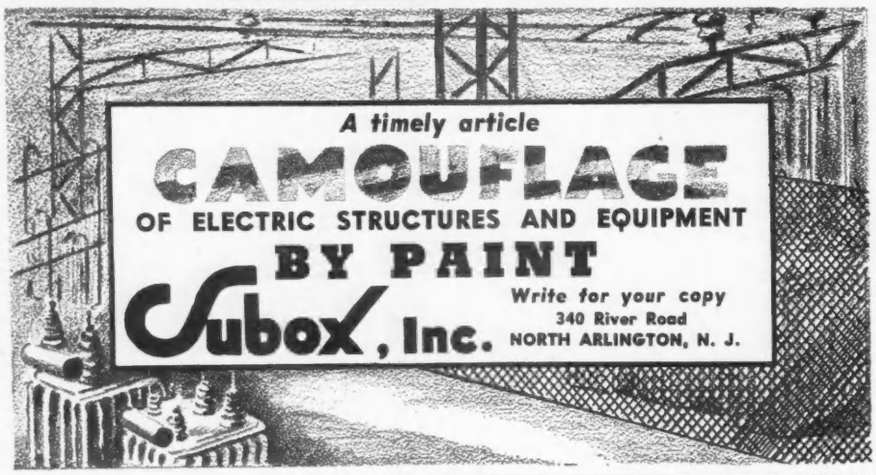

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facilities. Cost estimated over $3,000,000. Project will be supervised by U. S. District Engineer Office, Columbus.

TEXAS—Goodyear Tire & Rubber Co., Akron, Ohio, has concluded agreement with government for new plant in Texas for production of synthetic rubber, comprising several large multi-story processing and production buildings, with power substation and complete electrical operating facilities. Cost reported over $10,000,000, with financing through Defense Plant Corporation.

CALIFORNIA—Bureau of Power and Light, 207 South Broadway, Los Angeles, has approved plans for extensions in steel tower transmission lines in different districts, estimated to cost about $120,000. Work is scheduled to begin soon.

CALIFORNIA—Navy Department, Washington, D. C., has authorized construction of new naval training station in California on site 10 miles square. A main power substation is planned with several smaller transformer stations. Complete electrical equipment and facilities will be installed for industrial, airfield and residential service. An electric-operated pumping station will be built. Entire project will cost about $30,000,000. Punnett-Parez & Hutchison, 58 Sutter Street, San Francisco, civil engineers, have been engaged to survey site. Other engineering and construction awards will be made soon.

LOUISIANA—Louisiana Power & Light Co., New Orleans, plans extensions in transmission lines in connection with purchase of properties of Louisiana Public Service Corp., Lockport, now being consummated.

NEBRASKA—Southern Nebraska Rural Public Power District, Grand Island, plans extensions in primary and secondary lines in two new areas to be included in district in future, comprising Doniphan area in Hall County and Clarksville district, Merrick County. Permission has been granted by state. Proposed to begin work soon.

NEW HAMPSHIRE—Public Service Co. of New Hampshire, Manchester, plans early rebuilding of portion of power plant in Bristol area recently destroyed by fire. Loss reported close to $75,000.

OKLAHOMA—War Department, Washington, D. C., has authorized construction of new air force training school in Frederick area. A power substation will be built, with distribution lines and complete electrical equipment for industrial, airfield and residential service. Cost estimated over $3,000,000. U. S. District Engineer Office, Denison, Tex., will supervise project.

PENNSYLVANIA—Erie Lighting Co., Erie, has taken out permit for new multi-story addition to steam-electric power plant, equivalent in height to a three-story building. Additional equipment will be installed for increased capacity, including turbine-generator unit, high-pressure boiler and auxiliaries. Entire project is estimated to cost in excess of $2,500,000, with station structure to represent close to $450,000 of such amount.

•

Move to Larger Quarters

Eagle Electric Manufacturing Co., Inc., has moved to new and larger quarters at 23-10 Bridge Plaza South, Long Island City, N. Y.

FIGHT Electrical Fires with Rockwood WaterFOG

This new Rockwood Type N-20 Nozzle has remarkable extinguishing action on fires in such electrical equipment as transformers, oil switches, generators, regulators, etc., and inflammable liquids.

The Rockwood N-20 WaterFOG Nozzle projects a larger WaterFOG pattern a greater distance by a new Rockwood method known as the *internal* impingement principle of generating and projecting WaterFOG. This simply designed nozzle converts plain water into a combination of *high* and *low* velocity WaterFOG, the new extinguishing agent which cools and smothers fire. The *low* velocity WaterFOG with its greater extinguishing action is projected farther by means of the proper amount of *high* velocity WaterFOG induced into the *low* velocity pattern. Thus, it is possible to project *low* velocity fog into the seat of a fire and extinguish it from distances not possible heretofore.

Rockwood N-20 WaterFOG Nozzle	
¾"	$15.00
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1½"	25.00
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Fits existing fire hose lines

Electrical fires may be attacked and put out without danger of bringing the nozzle in contact with "live" electrical equipment. Extensive tests by a prominent engineering institute prove that Rockwood WaterFOG has a very low degree of conductivity making it safe to apply to electrical equipment carrying high voltages. Approved by Associated Factory Mutuals Laboratories for use around live electrical equipment and on flammable liquid fires.

Write for WaterFOG booklets. No obligation.

Rockwood Sprinkler Company

62 Harlow Street, Worcester, Mass.

For 36 Years Specialists in the Engineering, Manufacture and Installation of Fire Protection Equipment

New Funds Allotted for Rural Projects

The Rural Electrification Administration recently announced allotments totaling $1,268,900 to 24 systems in 17 states. These allotments are chiefly for the completion of service extensions to consumers living within 250 feet of existing distribution lines and for systems requiring reimbursement for extra expenditures.

Administrator Harry Slattery repeated the statements made in connection with earlier allotments that no new construction will be undertaken except in accordance with authorization or regulations of the War Production Board, and in the case of allotments involving acquisition of existing properties, the funds allotted for new construction will not be used until the war is over.

Among the allotments were:

FLORIDA—Peace River Valley Electric Membership Coop., Inc., Wauchula, Charles E. Crow, supt., $45,000 to extend service to a military unit.

GEORGIA — Central Georgia Electric Membership Corp., Jackson, Robert Armstrong, mgr., $6,000 for office headquarters building. Habersham Electric Membership Corp., Clarkesville, E. A. Lunceford, supt., $3,700 to provide office headquarters building.

KANSAS—D. S. & O. Rural Electric Cooperative Assn., Inc., Solomon, Fred B. Atkins, supt., $111,000 for 106 miles of line, 511 members. This includes $50,500 for acquisition of 13 miles of distribution line.

NORTH CAROLINA—French Broad Electric Membership Corp., Marshall, $750,000 to build and acquire 499 miles of line, 2,823 members in Madison, Avery, Buncombe, Yancy and Mitchell counties.

Also included were the following allotments to complete sections of systems:

INDIANA—DuBois Rural Electric Cooperative, Inc., Jasper, L. B. White, supt., $40,000.

KANSAS—Central Kansas Electric Cooperative Assn., Inc., Great Bend, William J. Groh, supt., $16,000.

KENTUCKY — Hickman-Fulton Counties Rural Electric Cooperative Corp., Hickman, George E. Knight, supt., $14,000.

MISSISSIPPI—East Mississippi Electric Power Assn., Meridian, Henry W. Foote, supt., $40,000.

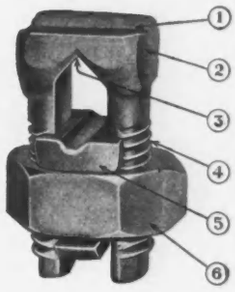
NEW JERSEY—Sussex Rural Electric Cooperative, Sussex, Paul Weldie, supt., $26,200.

NORTH CAROLINA—Carteret-Craven Electric Membership Corp., Beaufort, $12,000. Piedmont Electric Membership Corp., Hillsboro, John T. Alderman, supt., $10,000. Brunswick Electric Membership Corp., Shallotte, Edson D. Bishop, supt., $8,000. Burke-McDowell Electric Membership Corp., Morganton, Wm. E. Wortman, supt., $16,000.

OKLAHOMA—Indian Electric Cooperative, Inc., Cleveland, B. R. Ness, supt., $15,000. Central Rural Electric Cooperative, Stillwater, $15,000.

OREGON—Northeast Clackamas County Electric Coop., Inc., Sandy, Frank F. Christensen, supt., $20,000.

TEXAS—Magic Valley Electric Coopera-



Nutype Matthews Conductor Connectors

It's a fact that Matthews Conductor Connector sales showed a very material increase in 1939 over 1938. Quality will tell in the long run.

(1). Broad, strong head, with size plainly marked. Sides of head have flat surface so wrench or pliers can grip tightly.

(2). 100% Pure Copper, Cold forged bolt of ample strength for all purposes. High copper content prevents corrosion and season cracking. All edges are rounded.

(3). Modified "V" shaped groove, holds wires in three point contact and prevents rocking or looseness.

(4). 85% plus, full thread, die stamped, insures full engagement in nut, hence high strength connectors. No sharp edges.

(5). "V" groove clamping jaw of cold forged, 100% pure copper. Flanged sides give greater bearing surface on nut, hence greater strength.

(6). 97% copper content, hard metal nut—strong as steel. Full thread engagement with bolt.

(7). Made in 9 sizes—6 sizes of cold forged copper as illustrated and 4 sizes of machined high copper content alloy.

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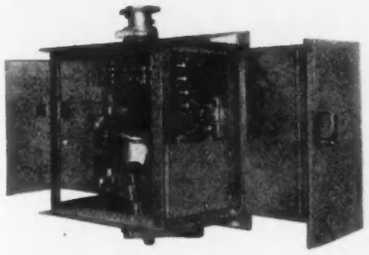

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WEST VIRGINIA—Harrison Rural Electrification Assn., Inc., Clarksburg, E. M. Johnston, supt., $30,000.

ALASKA—Matanuska Electric Assn., Inc., Palmer, C. Waldemar Mau, supt., $26,000.

•

Citizens Oppose Utility Acquisition in Lebanon

Another complication in Lebanon's five-year effort to acquire the local electric distribution system of the Public Service Co. of Indiana now confronts the City Council with petitions bearing the signatures of 222 citizens, demanding a second election on the ground that the property will cost twice as much or more than taxpayers had been promised when they voted on the proposition in 1937.

The administration is not expected to act on the petitions until the next regular meeting. In the meantime the city and the utility company are preparing briefs to submit to Special Judge Edgar A. Rice, who has taken under advisement his ruling on the application of the company for a permanent injunction against the city, which recently sought to gain possession by payment of $210,000 to satisfy a valuation placed on the system by a jury nearly two years ago.

•

Puts Burden of Proof on Utility Company

A Montana court ruling in favor of the Mountain States Power Co. against the city of Forsyth, Mont., has been reversed by the U. S. Circuit Court of Appeals.

While Mountain States company had a franchise to furnish power to the city, Forsyth negotiated with Fairbanks, Morse & Co. for construction of a city plant. Mountain States asked an injunction to prevent such construction, contending its franchise was still valid. The city denied validity, and without a trial the court granted judgment to the utility company, ruling the city's answer was not a legal answer.

The circuit court reversed this ruling on jurisdictional grounds. Mountain States Power's petition stated $3,000 or more was involved in the case, but city claimed such was not the case. The circuit court ruled that the burden of proof was on the utility to show how much money was involved in the action.

SERVIT *here!*

SERVIT *there!*

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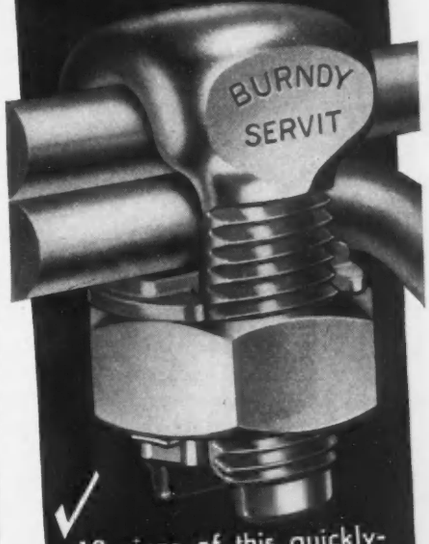

13 sizes of this quickly-installed high-strength service connector take from No. 10 Sol. to 1000 Mcm cable.

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LETTERS TO THE EDITOR

Area of Tubing in Circular Mils

To the Editor of ELECTRICAL WORLD:

Having recently been required to make quite a few calculations involving the current-carrying capacity of copper bus tubes, a simple method of determining the number of circular mils was evolved using only the O.D. and I.D. of the tube, in inches, without the bother of subtracting one area from another.

The calculation is based on the well-known algebraic factoring of D^2-d^2 into $(D+d)\times(D-d)$.

A 1-in. diameter rod has an area of 1,000,000 cir.mil, call it 1 MCM.

The area of any circular section in circular mils is diameter in inches squared, times one million.

Therefore, a 2-in. diameter rod has an area of 4,000,000 cir.mil or 4 MCM.

A tube with a 2-in. outside diameter ($D=2$) and a 1-in. inside diameter ($d-1$) would therefore have an area of $4-1=3$ MCM. That is, $(D+d)\times(D-d)=(2+1)\times(2-1)=3$.

This method may be new only to some and has probably been forgotten by old timers.

JOHN L. SKEEHAN,
American Bridge Company,
Ambridge, Pa.

•

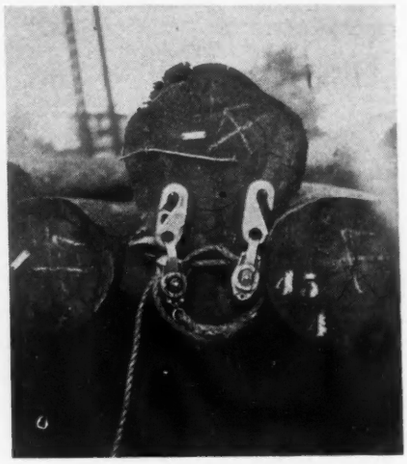
Blocks With Safety Hooks

To the Editor of ELECTRICAL WORLD:

The accompanying illustration shows a set of blocks with safety hooks which were installed in place of the regular open hooks. These are not a makeshift safety item like the leather strap and harness snap shown on page 104 of the ELECTRICAL WORLD for February 21, 1942.

We purchased these hooks about two years ago from the Western Hardware & Tool Co., Ninth and Mission Streets, San Francisco, Calif. They have been giving satisfactory service ever since. The latch on these hooks can be locked in either the open or closed position. When in the closed position the latch at the back of the hook must be pressed to release the catch.

These hooks, which we are using on a 4-in. set of blocks, are designed for a working load of 3,750 lb. The two larger sizes listed in the "Western" catalog are rated at 7,500 and 12,000 lb., respectively. However, they can



only be attached to a set of blocks where the straps can be removed by punching out the center pin.

I am sure any one using these hooks with wire grips will find them so valuable as a safety item and a time saver as to be worth several times their original cost.

HAROLD SEITZ,
Ohio Power Company,
Leipsic, Ohio.

•

"Write-Ups" Rehearing Plea Denied by FPC

Federal Power Commission has denied petitions for rehearing filed by the St. Croix Falls (Minnesota) Improvement Co. and the St. Croix Falls (Wisconsin) Improvement Co., in which the companies sought rescission of certain provisions in the commission's order which determined the disposition to be made of excess of acquisition cost over original cost, and declared that construction profits in affiliated company transaction are "write-ups."

The recent opinion states that "no new facts or principles of law are set forth which the commission had not fully considered."

•

New Municipal Equipment Operating

The Watertown, S. D., municipal plant's $300,000 worth of new equipment has been placed in operation recently, increasing the generating capacity from 2,350 kw. to 5,350 kw.

Total cost of the new project, begun last year, was $327,000, according to C. R. Hennick, superintendent of the light department. Of this amount WPA contributed $26,000 worth of labor and materials, bringing the cost to the city to $301,000.

"Ten Silver Months . . ."

"EVERY WEAPON *we make today is worth ten that we might produce next year; for this year – 1942 – is the critical year in the existence of the United States.*"

This grim challenge was thrown at American industry by Donald Nelson in his first speech as chief of the War Production Board. He was speaking to a group of business paper editors, called together to receive at first hand Mr. Nelson's urgent message to the industries they serve.

"We've wasted the golden months", he declared, "the months in which we could have expanded our steel industry, our chemical industry, our copper industry, and all the others, so that we would have plenty of everything. But we still have ten silver months – the months that remain in 1942–and in them we can do things that we never thought possible."

To that objective Mr. Nelson has dedicated his high talents and boundless energy. And to that task he asks American industry to apply the full measure of its resources and skill.

That challenge should be all that it takes to exact from industry the last ounce of its energies. For by now we all can see that in this war the American way of life is at stake. American industry is the essence of the American way of life. Neither can survive without the other. So, even if it had no better reason, industry must go all out to win this war as a measure of self-preservation. Here self-interest and patriotic duty are synonymous. American industry cannot afford to let America lose this war.

The 1942 job is crucial. If it is well done we have a chance to win. If it is badly done we cannot possibly win. There is the measure of the responsibility that now rests upon the shoulders of industrial management.

It is not just Donald Nelson who asks this of industry. He speaks for the millions of fighting men – on land, at sea, in the air – the world over, whose eyes turn so desperately to the workshops of America. There and there alone can they see the hope of victory.

The people of America are not going to let those men down. They demand of industry every effort and every sacrifice that may be necessary to back them up. On that score, American industry stands, of necessity, on trial before our people. It must come through – or else!

* * *

As industry goes all out to meet this demand, its management asks of those who set its tasks and supervise its performance the utmost possible cooperation. It asks of them specifically an understanding of its problems and a chance to work them out without unnecessary interference. It asks for protection against attack from the rear while it concentrates its energies against the common foe. It asks a truce on economic reforms and social experiments that have nothing to do with winning the war and that are bound to arouse misgiving and mistrust amongst the proprietors of industry. Above all, it asks that it be not made a political scapegoat for every deficiency that is sure to develop in the confusion of a war effort.

This does not mean that industry resents honest criticism or constructive direction. Neither does it mean that it is unwilling to do its best unless it can have its own way in all things. The managers of industry are practical men. They know better than anyone else that unprecedented conditions call for new methods, that they must be open-minded to every criticism sincerely directed toward winning the victory. They know that no one can afford to be smug in the face of a national crisis.

There would be no point to my rehearsing here the pros and cons of such criticisms. Time is too short for that. Only in its performance can industry write a convincing answer to its critics. But as a help toward the achievement of that performance, I should like to clear up, if I can, one prolific source of misunderstanding and mistrust.

I refer to the solicitude of industrial managers as to where their companies may find themselves after the war. *This concern for the future sometimes is misinterpreted to mean that management is blind to the urgency of the present. But it does not mean that. It is a perfectly natural anxiety that must be felt by any responsible management operating under the American enterprise system – which is one of the things we are fighting to preserve.*

Under our system, the managers of industry cannot but feel a sense of responsibility to its owners, not merely for current dividends on their investments but also for the conservation of their properties. That means they must feel some concern over what may happen after the war to a business that now must go all out to help win the war. And their concern is but part of a general concern over what may be the effect of the war on the whole American way of life, preservation of which is our reason for being at war.

To give practical effect to that concern under present conditions is one of the problems of management. It is not an insuperable problem. Competent management will be able to surmount it, I am sure. But the right kind of help from those in authority can make the job a lot easier. And let us note in passing that the problem cannot be written off, as some critics of business seem to think, merely by setting off against it the profits that business can make on war contracts. That misses the whole point.

For a business enterprise is not, as many seem to think, just a "profit-machine." It is not set up and operated by its owners and managers for the sake of this month's or this year's profits, without regard to any other consideration.

The fact is that any worth-while business must operate as a going concern. It consists not only of stockholders and managers, but also of employees, markets, distributors, and dealers. Mostly, I might say, of markets, distributors, and dealers. They are the "reason for being" of any business, the source of its payrolls and its profits.

No competent management wants to scrap such essential elements of its business just for the sake of war-bred profits, however large they might look . . . at the moment. Most of the original reluctance to get into arms production, for which industry has been criticized, was not due to a "greed for profits", as has been charged. Rather did it arise from management's mistrust of "war profits" that can be made only by sacrificing the essential elements of a healthy business.

* * *

But now industry faces a dire national emergency. The survival of our country and all its institutions – including American business–is at stake. So management must shape its course to meet without stint every need of the war

effort. That means it must subordinate to that effort every other concern. To lose the war is to lose all. We must first win the war if we would save anything.

To the men of management that presents a grave responsibility. It is fair to ask whether government can do anything to help them meet it. One simple thing I think government can and should do. It cannot dissolve all the concerns of management, but it can help substantially.

Government should do all it can to help management conserve those assets of business that will contribute to post-war reconstruction, when that can be done without prejudice to getting on with the war.

Let me explain. Broadly speaking, every business comprises three elements. One is its tangible assets – its factories, machinery, equipment, and materials. Another is its productive capacity – its management, organization, trained working force. A third is its intangible assets – the goodwill, familiarity, acceptance, and recognition that it enjoys amongst its dealers, customers, and prospective customers.

When the nation goes to war government becomes the one dominant customer of a business. Of these three elements, the first two – plant facilities and organization – become of paramount importance to the job in hand. But so far as the government buyer is concerned, the third drops to minor importance.

But that third element cannot be ignored by the managers responsible for that business. For it will be their mainstay when they must rebuild that business after the war, when government has lost all interest in its existence, except as a source of tax revenue. That is why government can help greatly if now, during the war, it recognizes the legitimate concern of management to conserve those assets that will be essential to survival after the war.

Everyone recognizes the obligation of government to demand that the individual business go all out for war production, to forbid the production of goods not essential to wage war and to commandeer those that are, to require that a business sacrifice its markets and disrupt its distribution organization. No one questions the right of government to restrict arbitrarily the amount of earnings that a business may retain as profit from its war activities. In short, no one questions the right of government to become the dominant partner in any business that may be needed to win the war and, as dominant partner, to put the national need above any conflicting interest of the business.

But, as it does all this, government should remember that the survival of that business is staked on the public's knowledge and use of those discontinued or commandeered products, on the stability of that crippled dealer organization, on the ability of the business to maintain its standing in a market-place from which, temporarily, it may be barred.

And government can help management to deal with the exacting task it now faces, if it will do all it can to avert the needless sacrifice of business interests that do not conflict with war needs, if it will but remember that one of these days, that business again will be on its own, gathering up whatever resources it may have left, recreating its markets, rebuilding its distribution channels, reestablishing itself as a going concern . . . and doing all this in a competitive world without benefit of war orders.

The only foundation upon which any business can hope to rebuild when that day comes is its customers' memory of its name and their understanding of its products. Whatever credit may be coming to it for its war effort will not avail it very much if it permits itself to be forgotten. Its chief assets in that day will be the identity, recognition, and acceptance it still enjoys amongst those to whom it must look for business.

That is why so many business men, already going all out on their war jobs, become apprehensive whenever some word or act of a legislator or government official seems to question the validity of their sales, promotion, and advertising activities during the war. For they know that it is by such measures alone that any management can hope to conserve – while its business goes to war – the values it will need when it returns to civilian service.

That is why I ask government to do all it can to allay such uncertainties, to reassure business of its desire to help conserve those intangible assets that mean so much to business security. For that, I believe, will strengthen the hand of management in a big way as it goes all out on the vital job Donald Nelson has staked out for industry.

* * *

He has told us that if we are to make these ten silver months productive enough to make up for the golden months that are gone, industry must do things it never thought it could do. That is dead right. For America now finds itself in a position it never thought it could be in.

All too slowly, but very surely, it is dawning upon us that this is OUR WAR. Moreover it was our war long before we knew it or did much about it. So our job today is not merely to match the current production of our enemies. That is not enough. We must produce also enough to match the surplus of resources they had built up before we got started. We must produce enough not only for our own needs, but also for all the United Nations.

Moreover we must produce all that we need for decisive victory, for anything short of that will mean defeat. If we would save the American way of life, we must destroy once and for all the forces that threaten it. A stalemate would mean but an armed truce and what that might do to the American way of life and to American industry no one dares to guess. Victory must mean *decisive* victory. And this, very definitely is our war.

And just as definitely, this is OUR YEAR. For in this year – 1942 – we must prevent our enemies from achieving an advantage that might put victory forever beyond our reach – despite all our vast resources. It is an appalling fact that victory may slip beyond our grasp – not in 1943 or in 1944 – but during the months just ahead of us.

"Industry's responsibility in all of this is great," says Donald Nelson. "The job will take brains and initiative, but we can do it if we go out with a will."

To Mr. Nelson, that initiative means that industry must lead rather than follow in the march to more intensive use of our machines and our man-power. We dare not wait for new facilities to meet our mounting needs. More and more we must press for more widespread subcontracting and conversion. And he is counting on that initiative, backed by ever more aggressive effort, to avert or to minimize the compulsory measures that now seem imminent.

"We must stop thinking about what we're going to do to the enemy in 1943 and start thinking of what we're going to do to him in March of 1942.We must make today the things we would be making next year . . . if we had the time to spare."

That, says Donald Nelson, is the task of American industry during the next "Ten Silver Months." And to that gigantic task American industry now must bend every ounce of its abundant strength.

James H. McGraw, Jr.

President, McGraw-Hill Publishing Company, Inc.

This message is appearing in all McGraw-Hill industrial and business publications, reaching over a million readers.

This advertisement also appeared in:
NEW YORK TIMES
CLEVELAND PLAIN DEALER
CHICAGO DAILY NEWS
DETROIT FREE PRESS
WASHINGTON POST

You Expected to Read This NEXT YEAR!

Industry after industry is beating its promise as America's war production sets new world's records . . . Management, labor, W. P. B., Army, Navy, the Maritime Commission and other government departments are cooperating to make next year's headlines come true THIS year.

In World War I, the Kaiser feared American manpower. In World War II, Hitler is even more fearful of our rapid transition from peace to war production. . . . He has reason to be afraid.

Printing press factories are exceeding quotas on anti-aircraft gun parts.

Spark plug manufacturers are setting new speed records in machine gun production.

The heavy-transportation industry is making giant chassis for big guns at a faster rate than all the Axis powers combined.

In this industry, men who used to make locomotives and tractors are changing "Too Little and too Late" to read "Too Much and too Soon," from the enemy's viewpoint.

Starting just a few months ago, with a bale of blueprints and a knowledge of how to build such things as road-scrapers, power-shovels and trucks, the heavy-transportation industry is turning out mobile artillery that will shake the earth in more than a literal sense.

• • •

The story of how this industry joined the army carries a significance which should be understood and remembered.

The significance is that America has solved the problem of exchanging production techniques between specialized industries. This process went on unnoticed in peacetime. War gave it prominence.

OVER

▶When the bales of blueprints were first delivered, and the heavy-transportation industry started on its job of producing prime-movers and chassis for big guns in quantity, new production techniques were needed in a hurry.

▶Here are some of the questions that arose:

"How do you weld such heavy sub-assemblies?"

"What welding fixtures will handle these parts so that our workmen can always weld down-hand?"

"How can we make these long, heavy welds and have sound metal from one end to the other?"

"What's the best technique for testing welded parts? Shall we x-ray, or use the magnaflux process?"

"What's the best way to support these welded assemblies for machining?"

That's just a few of the thousands of questions that arose in the minds of experienced men when they had to solve new problems.

They illustrate the fact that American production methods depend upon specialized techniques and machines.

Each man with such a problem knew that someone, somewhere, had solved his problem, or might solve it before he could work out his own answer.

Therefore he turned to the source of industrial information he had always used when he wanted to know what others were doing . . . his industrial magazine.

Ever since the Maginot Line was flanked, the Industrial Press of America has been helping rookie industries to become veterans in the battle of war production.

▶It doesn't do this by exhortation or command, but by answering thousands of specific questions.

Just as newspapers keep their war correspondents at the front, Industrial Magazines keep their "war-production-correspondents" in the plants where weapons and equipment are made. McGraw-Hill editors are mobilized for war as literally as though they were firing weapons instead of helping to produce them. More than 90% of the time of McGraw-Hill's 153 editors and 725 engineer-correspondents is devoted either to visiting war-production plants (to study production techniques) or in writing "war stories" on how production problems were solved.

"Know-how" is the secret of the amazing records now being made by American Industry. And "know-how" comes from thousands of "little facts" like this:

Information on tool shapes for cutting the harder steels of war is vital literature to the engineer, designer or production man with the particular problem of cutting those steels confronting him.

The industrial editor does not work alone in giving vital information to men on the production line. In much the same way, manufacturers are war-converting their industrial advertising to show their readers how to use their products more effectively. For instance:

A business-paper advertisement showing how to make old taps and dies last longer has no glamour for anyone but the man who must rush production with an inadequate supply of new ones. To him it has enough "oomph" to be clipped and placed on his office wall.

To the casual observer, the Industrial Press is about as exciting as the rows of wires that stretch along every road and railway. . . . The simile is very apt. Both exist solely for the interchange of ideas. Both are typically American in the extent to which they have been developed and applied to the whole economy. . . . *This advertisement published by the McGraw-Hill Network of Industrial Communication.*

• • •

THE McGRAW-HILL NETWORK

23 PUBLICATIONS WHICH HELP MORE THAN 1,000,000 EXECUTIVES, DESIGNERS AND PRODUCTION MEN TO EXCHANGE IDEAS ON WAR-PRODUCTION PROBLEMS

American Machinist • Aviation • Bus Transportation • Business Week • Chemical & Metallurgical Engineering • Coal Age • Construction Methods • Electrical Contracting • Electrical Merchandising • Electrical West • Electrical World • Electronics Engineering & Mining Journal • E. & M. J. Metal and Mineral Markets • Engineering News Record • Factory Management & Maintenance • Food Industries • Mill Supplies • Power • Product Engineering • Textile World • Transit Journal • Wholesaler's Salesman. Also publishers of thousands of books for technical and engineering schools and colleges, as well as for general business use.

McGRAW-HILL PUBLISHING COMPANY, INC.

330 WEST 42nd STREET, NEW YORK

Supplement to April 4, 1942,
Issue of ELECTRICAL WORLD

Fluorescent Tube and Fixture Use Order

Because of the conflicting and incomplete stories in the daily press concerning the Thursday order of WPB on fluorescent lighting fixture production and use limitations, this special bulletin from ELECTRICAL WORLD'S *Washington Bureau is inserted in this issue as a special service to our readers.*—Editors.

Production of fluorescent tubes and fixtures is restricted to essential industrial lighting jobs by an order issued April 2 by the War Production Board.

The order provides that after 20 days from the date of the order fluorescent fixtures may be produced only to fill orders bearing A-2 or higher priority ratings. After 60 days from the date of the order, fixtures may be sold only on an A-2 or higher rating. Purpose of the 20-day period is to permit manufacturers to use up existing inventories for non-industrial types of fixtures, and of the 60-day period is to permit manufacturers and dealers to fill existing orders which could not obtain an A-2 classification.

Under the curtailment program thus outlined, new installations of fluorescent lighting will be limited almost exclusively to plants working on war orders. It is stated officially at WPB that there is, however, every intention of permitting fluorescent fixtures to be installed where a definite showing can be made that the improved lighting will benefit production. New war plants or plant additions in most instances will have a blanket priority high enough to qualify for fluorescent.

Plants desiring to convert from old lighting to fluorescent may apply to WPB on PD-1A forms and where a showing can be made the rating will be granted, it is stated. Not only will improved lighting be considered in ruling on conversion jobs, but also WPB will consider as a factor the possible savings in lighting demand on power systems in critical areas. This latter point was the determining factor in favor of fluorescent in a recent textile mill rewiring job.

Production of fixtures and tubes for servicing and replacing worn out equipment on existing installations is not limited by the order. Manufacturers will be allocated materials to keep existing fluorescent fixtures in operation. The War Production Board pointed out that failure to maintain existing installations simply would defeat the purpose of the program, by causing users to switch to incandescent installations, thus consuming new critical materials in greater quantities.

Electroline FIEGE HEAVY-DUTY DEAD-END

FOR COPPER STRAND (300 to 1000 MCM)

Gives You These SIX ADVANTAGES

1 **HIGH PRESSURE**—Metal to metal contact under high pressure gives ultimate electrical and mechanical strength.

2 **STRONGEST TYPE OF DEAD-END** when used with steel, copper, or composite strands.

3 **SOLDERLESS**—No hot metal is needed. No special tools required. Common tools make or unmake the connection.

4 **EASY INSPECTION**—Inspection holes make visual inspection of the joint quick and positive. No guess work. A sound connection is certain.

5 **NO WASTE** of conductor. The connector can be used over and over again. Easily disconnected. Free from corrosion.

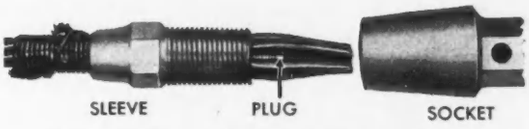
6 **CONDUCTIVITY**—Its resistance is less than an equivalent length of the conductor.

SIMPLE TO INSTALL

ONLY THREE SIMPLE OPERATIONS TO COMPLETE THE DEAD-END CONNECTION

Strand passed through sleeve.

Wires broomed out for insertion of hollow plug.



Plug driven in and wires closed to apply socket.

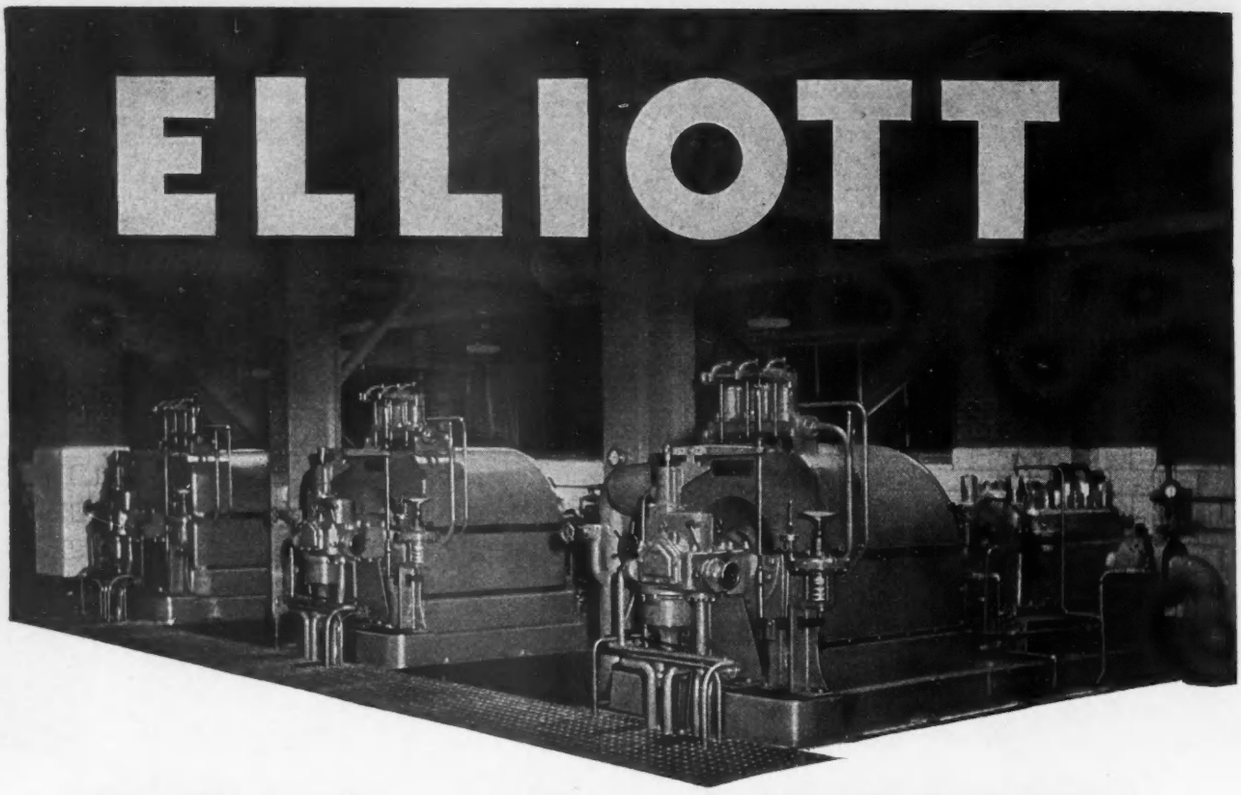
Socket applied showing twisted wires and completed assembly

Available in complete range of sizes from 300 MCM to 1000 MCM in Dead-End types as illustrated. Also made in Eye and Straight Coupling types. ***Write today for complete prices and illustrated literature.***

Electroline Company

Originators and Patentees of Automatic Line Splices and Dead Ends

4121 SOUTH LA SALLE STREET • CHICAGO, ILLINOIS



Boiler-Feed Pump TURBINES

To serve two high-pressure boilers installed with a topping turbine, the Metropolitan Edison Company at Reading, Pa., installed three boiler-feed pumps driven by Elliott steam turbines. These turbines are of the multi-stage, high efficiency type, take steam at 250 lb. pressure and exhaust at 3 lb. to two Elliott 400,000-lb.-per-hr. deaerating feedwater heaters which serve the high-pressure boilers. The use of these variable-speed turbine drives permits a steam saving and assures closer feedwater control.

Modern auxiliary turbine drives, running up to several thousand horsepower, cover a size range in which Elliott Company has specialized for many years. In this field, our engineers have accumulated valuable experience and have developed special competence. They know how to fit the turbine to your needs and conditions and how to attain both high efficiency and maximum dependability. Ruggedness is characteristic of Elliott turbines, both multi-stage and single-stage.

ELLIOTT COMPANY

STEAM TURBINE DEPT., **JEANNETTE, PA.**

District Offices in Principal Cities

H-659

TURBINE-GENERATORS • MECHANICAL DRIVE TURBINES • ENGINES • ENGINE-GENERATORS
MOTOR-GENERATORS • MOTORS • GENERATORS • CONDENSERS • STEAM JET EJECTORS
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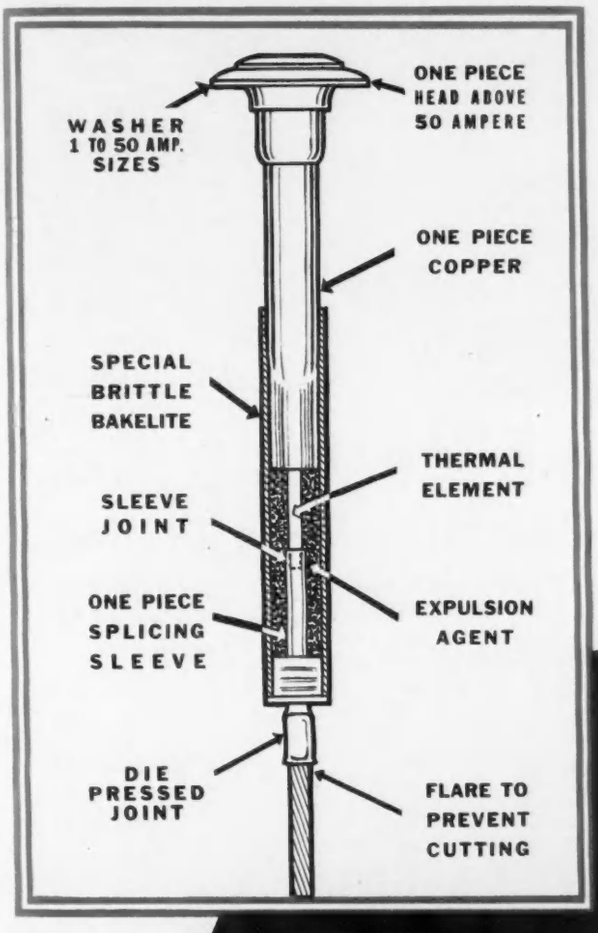
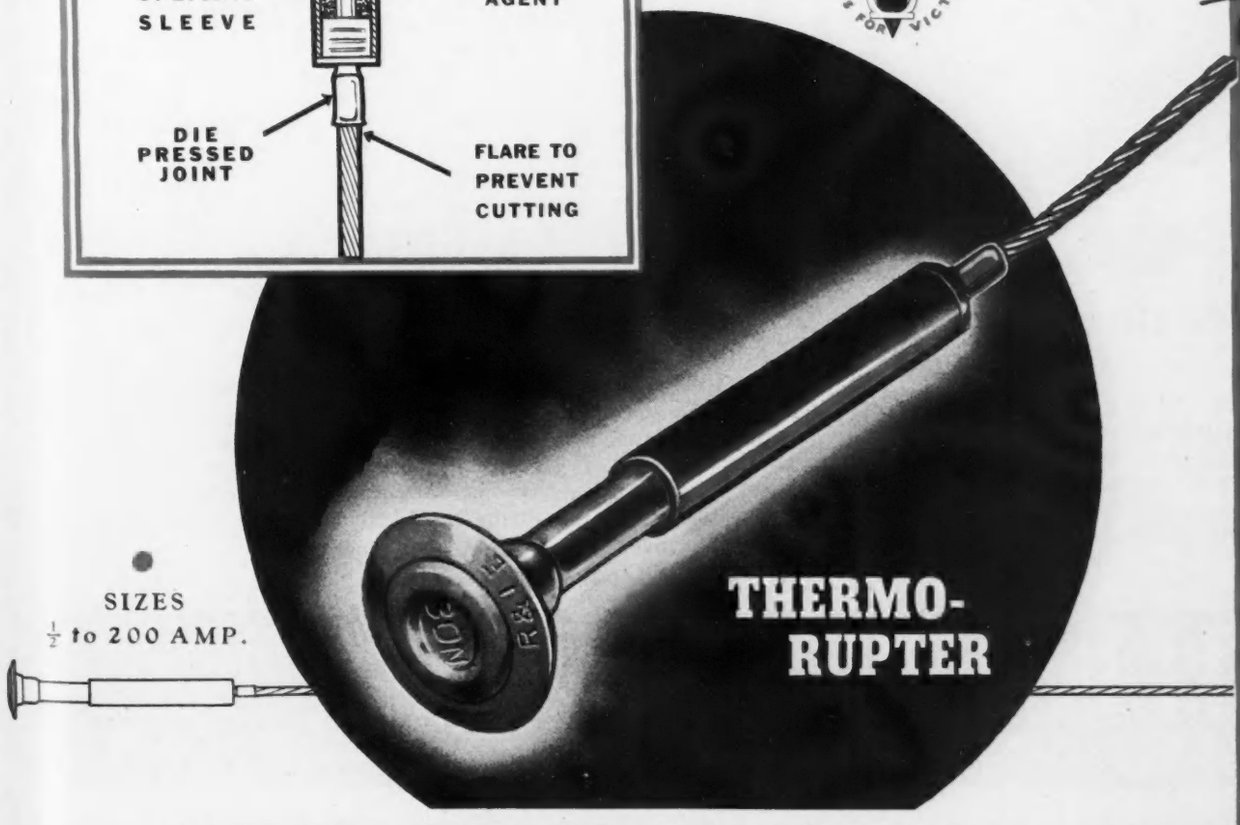
CHECK THE FACTS on R&IE Products



CUTOUT LINK

A highly effective interrupting link with exact predetermined overload firing action. No fusing element—no partly melted links . . . . . Repeated overloads do not reduce rating. Has unusual strength.

VOLTS FOR VICTORY



THERMO-RUPTER

● SIZES ½ to 200 AMP.

- ENGINEERING AND PRODUCTION
- COMPLETE SUBSTATION
- OPERATING MECHANISMS
- DISCONNECTING SWITCHES
- AIR BREAK SWITCHE
- CONNECTORS
- BUS CLAMPS
- CUTOUTS
- THERMO-RUPTERS
- METAL HOUSED ISOLATED BUS
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- METAL CUBICLES
- INTERLOCKS
- TESTING DEVICES

RAILWAY AND INDUSTRIAL ENGINEERING CO. . . . GREENSBURG, PA.

In Canada—Eastern Power Devices Ltd., Toronto

Haste WITHOUT Waste!

SAVE TIME and CONSERVE MATERIAL WITH DELTA-STAR ALL-STEEL CLAMP THREE-CONDUCTOR CABLE SUPPORTS

WAR PRODUCTION demands speed: minutes count. One day's delay of guns, tanks, ships and planes may mean the loss of a decisive battle. Conservation of time and material is imperative; waste is criminal. HASTE WITHOUT WASTE is the order of the day.

Open wiring with DELTA-STAR three-conductor time-and-material-saving cable supports is solution for quick, practical and permanent construction, the best answer for unseen changes—extensions, additional taps and rearrangements can be made quickly and easily.

All conductors are within same clamp—no heating. All-steel clamp eliminates bronze—saves copper, tin and zinc. Close triangular spacing results in balanced circuit with low reactance. Permits multiple circuits of same size conductors—may save delay in securing large cables. High current densities are possible. Occupies minimum space. Furnished with separable bases for pipe, beam, or flat mounting, or with hook for messenger suspension.

CONSIDER THESE ADVANTAGES—

TRIANGULAR TYPE—ELECTRICAL BALANCE—CLOSE CONDUCTOR SPACING—LOW REACTANCE—MINIMUM SPACE—LOW COST—FLEXIBILITY—QUICK CHANGES—ALL-STEEL CLAMP—HIGH CURRENT DENSITY—MULTIPLE CIRCUITS—WITH OR WITHOUT BASES

ASK FOR BULLETIN 31-F and PUBLICATION 4103-A

DELTA-STAR ELECTRIC COMPANY

MAIN OFFICE AND FACTORY—2400 Block, Fulton St., Chicago, Ill.
NEW YORK OFFICE—140 Cedar St., New York, N.Y.

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CANADIAN ASSOCIATE
Canadian Line Materials Limited.....Toronto 13, Canada

It isn't the *AVERAGE INSULATOR* that drops a line--

it's the *WEAKEST!*

When you see, "15,000 lbs." or some other strength marking on the cap of an O-B suspension insulator, you know for a certainty that every unit in a string, or a carload, will perform safely above that value. That's the M & E rating, or the minimum strength in the case of O-B insulators, below which no unit fails.

Minimum strength is a specific amount. It applies to every single unit on a line, no matter how many. A higher *average*, of say 18,000 lbs., admits of variations, and it takes only one abnormal variation on the low side to cause trouble.

Through unique control of both manufacturing and testing of suspension insulators, O-B can brand these insulators with minimum strength values--your most positive assurance of trouble-free performance, because it applies to *every one*.

Ohio Brass

MANSFIELD, OHIO

Canadian Ohio Brass Co., Ltd., Niagara Falls, Ontario

2340-H

★ ★ ★ ★ ★ ★ KEEP BUYING WAR BONDS ★ ★ ★ ★ ★ ★

HERE'S PROOF

Backed by "ON-THE-LINE" Performance!

I like these simplified supports for direct pole mounting that cut installation time. Too, I like the standard support spacing and bushing location that means complete interchangeability of all sizes and makes.

ASK ANY group of distribution engineers what makes the new Allis-Chalmers EEI-NEMA Distribution Transformer give greater "on-the-line" performance . . . and chances are each one would point to a different reason.

But the cost-cutting operation and greater dependability you get with this new transformer is not due to any *one* reason . . . but to many reasons, including the SIX STAR FEATURES that make it stand out from all other distribution transformers on the market.

And besides these six star reasons are such other important features as improved clamp type connectors with replaceable parts . . . lead buffer shields that give the transformer extra mechanical protection at all strain points . . . and low density cores for reduced exciting current harmonics.

New Features = New Service

In fact, in designing and manufacturing these new units, we stressed the wartime need for improved all-'round "on-the-line" performance all the way through. We emphasized built-in full value. We avoided manufacturing short cuts that would sacrifice quality. We introduced more *new* features than you ever saw before in a distribution transformer.

For the full story on how to get better distribution transformer service at a savings . . . write Allis-Chalmers, Milwaukee, Wis., for your copy of Bulletin B6159.

A-1507

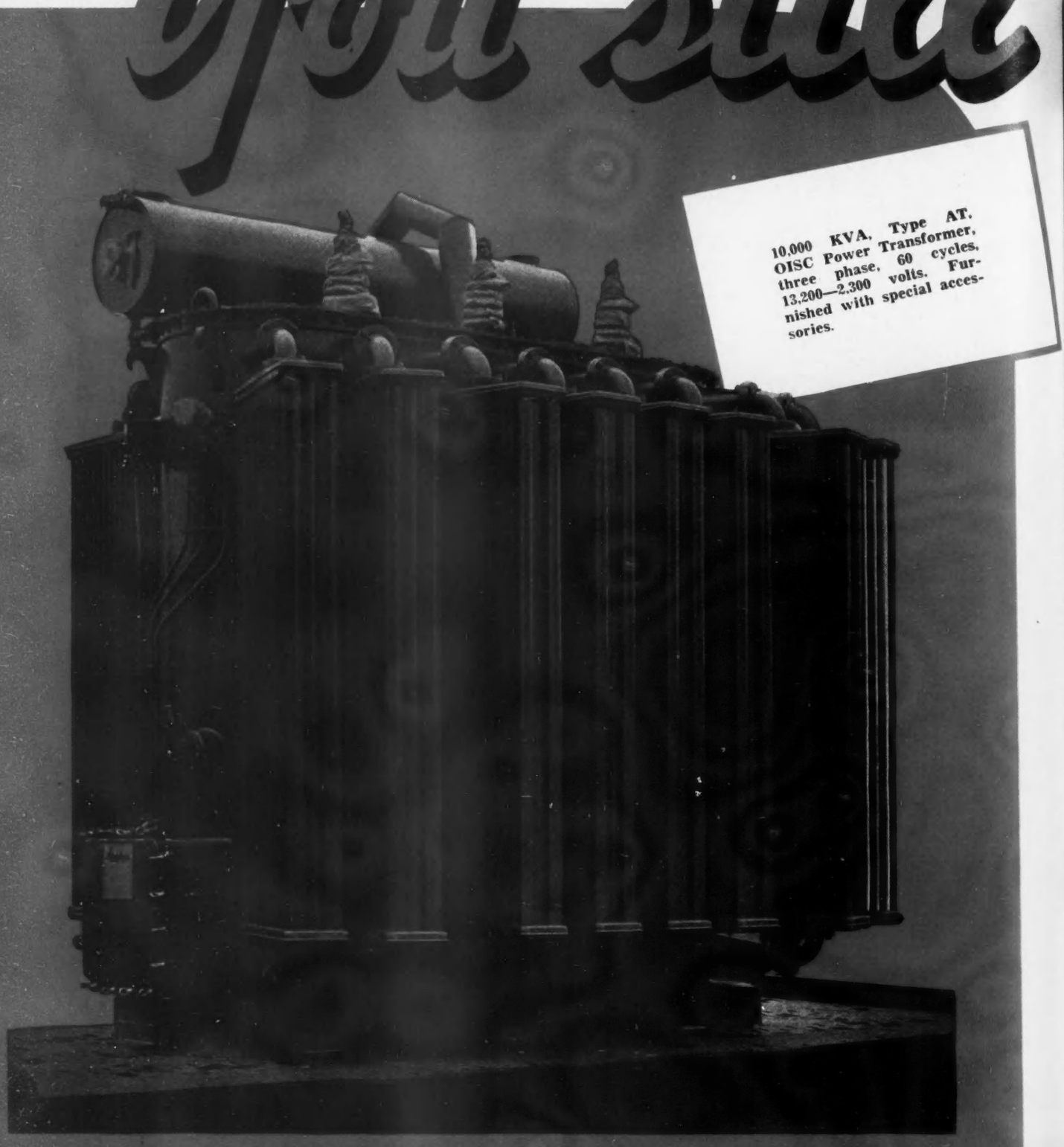
ALLIS-CHALMERS

My vote is for the new, durable, copper-bearing steel tanks. Tested under great pressure, they are protected against oil leakage, assuring long life and complete safety.
The new Spra-bonderizing process is what attracts me . . . plus the triple coat automobile finish. That's what gives the tanks positive four-way protection against rust and corrosion.
You can't beat these extra-heavy porcelain coordinated bushings. They have liberal creepage and offer maximum reliability under fog, dust, chemical, or other conditions.
There's nothing better than this double conductor insulation—flexible enameled wire, plus the added protection of well-lapped cable paper, providing double safety against winding failures.
Me—I like the improved core and coils, liberally designed. They mean extra years of service-free "on-the-line" performance under all types of operating demands.

TRANSFORMERS

WE WORK FOR VICTORY — WE PLAN FOR PEACE

You still



10,000 KVA, Type AT, OISC Power Transformer, three phase, 60 cycles, 13,200—2,300 volts. Furnished with special accessories.

The Standard Transforme

WARREN · · · OHIO

want Quality

While we're all rushing to complete the jobs assigned to us in the nation's war effort, let's not forget that the transformers which are being rushed away from factory production lines to important defense installations must be able to withstand more abuse than those manufactured in normal times.

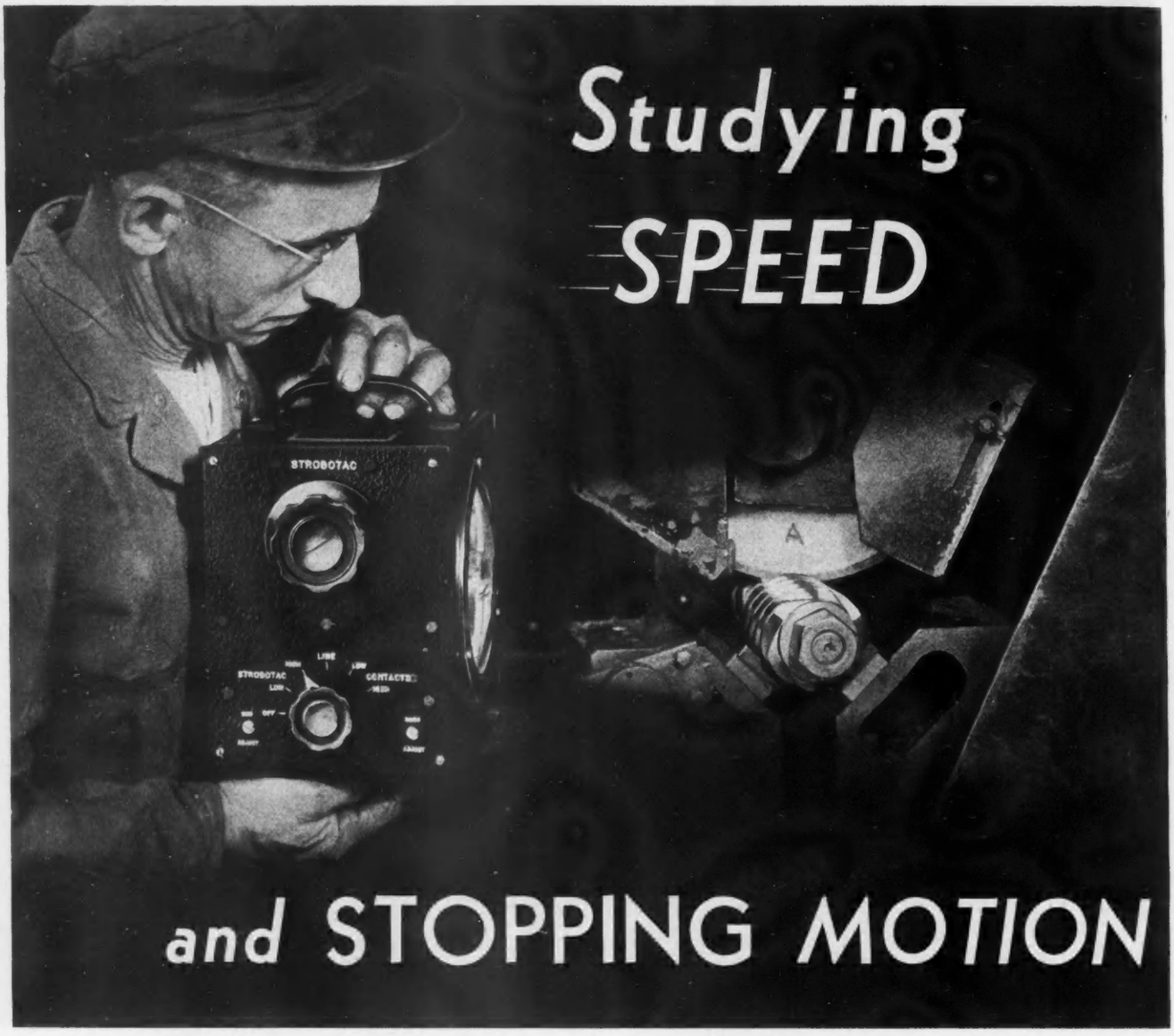
These transformers, which are being shipped to Army and Navy Bases, Ordnance Plants and other war-time projects, must not become 'war babies,' otherwise the material and time thus expended in production are irrevocably lost and our war program will be subjected to critical delays.

An experienced inspection department, closely co-ordinated with our production force, enables The Standard Transformer Company to produce transformers at war-time speed without sacrificing the qualities that are essential to the efficient and trouble-free operation of any transformer.

Our nearest sales representative will be glad to confer with you promptly about your transformer requirements.

7,500 KVA, Type AT, OISC Power Transformer, three phase, 60 cycles, 38,060Y—2,300 volts. Sectionalized case—special accessories.

me Company



THE STROBOTAC lets you see this high-speed helical gear grinder in operation just as this mechanic sees it . . . absolutely stationary . . . although it is revolving at 10,400 rpm!

With a slight adjustment of the STROBOTAC the grinder appears to revolve in s-l-o-w motion . . . even as slow as a fraction of an rpm . . . so that the exact cutting angle, depth and shape of cut be be seen.

The STROBOTAC has helped thousands of others to speed up production and to cut down shutdowns. It can help you if you want to see how your equipment runs . . . if you want to stop or slow down motion in any machine or part operating at any speed up to 100,000 rpm!

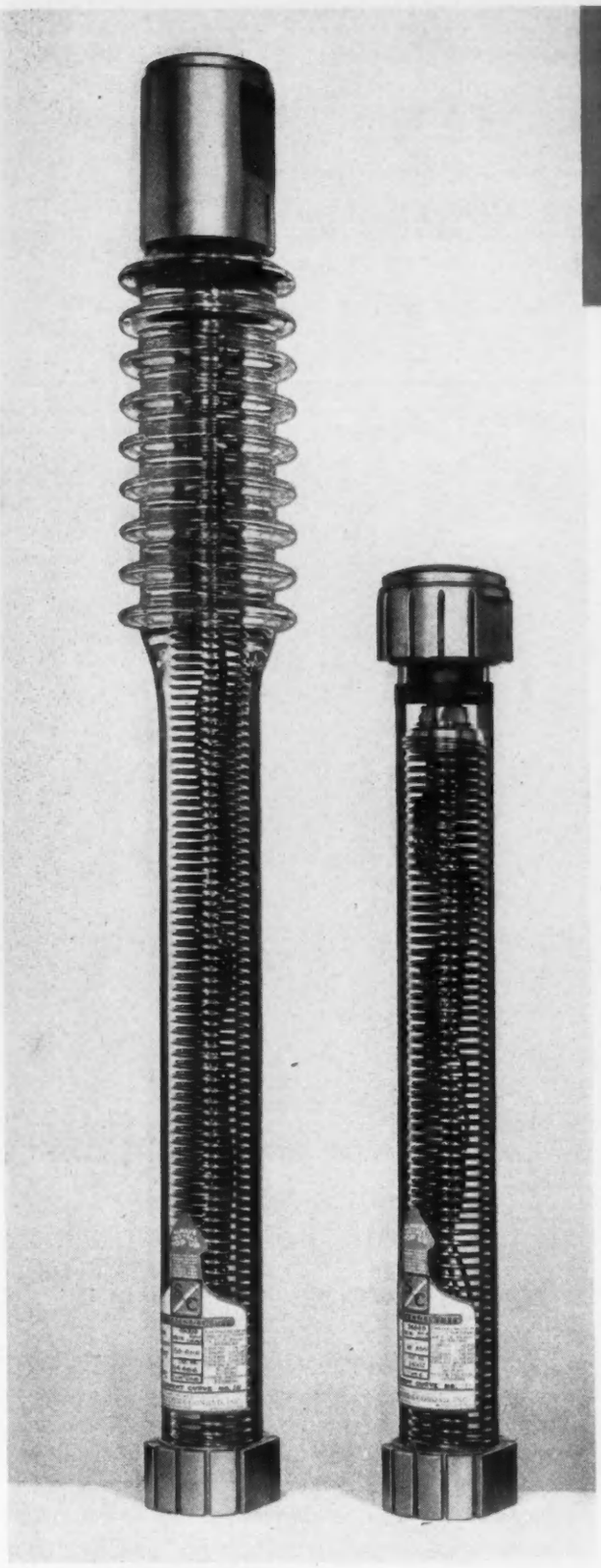
In addition the STROBOTAC is a very accurate electrical tachometer for measuring rpm; it is direct reading from 600 to 14,400 rpm; it requires no mechanical or electrical connection to the machine or part under observation; it places absolutely no load on even the lightest piece of equipment; it is ideal for speed measurements on motors and other revolving equipment when the machine is in a hard-to-get-at place; it costs only $95.00 complete and ready for immediate use.

Because practically all of our manufacturing facilities are devoted to National Defense projects, to secure delivery of this equipment within a reasonable time a preference rating certificate or other approved priority rating will be necessary.

The STROBOTAC can help you! Let us show you how!

Write for Bulletin 763 for Data

GENERAL RADIO COMPANY CAMBRIDGE MASSACHUSETTS



CUT USE OF CRITICAL METALS

Use S&C Fuses for Protection

Thousands of pounds of copper, brass, and steel are saved by the use of S&C Liquid Fuses for dependable system and equipment protection. This is accomplished because much smaller amounts of critical metals are required than by other protective and current-interrupting equipment.

S&C Liquid Fuses are not destroyed when they operate under short circuit conditions and may be put back in service with a minimum of replacement parts since the critical metals used in their construction,—the brass and copper ferrules seldom need replacement. If you have blown fuses on hand, return them to the factory now for rebuilding.

SCHWEITZER & CONRAD, INC.
4435 Ravenswood Avenue, Chicago, Illinois
Manufactured in Canada by Powerlite Devices, Ltd., Toronto, Ont.

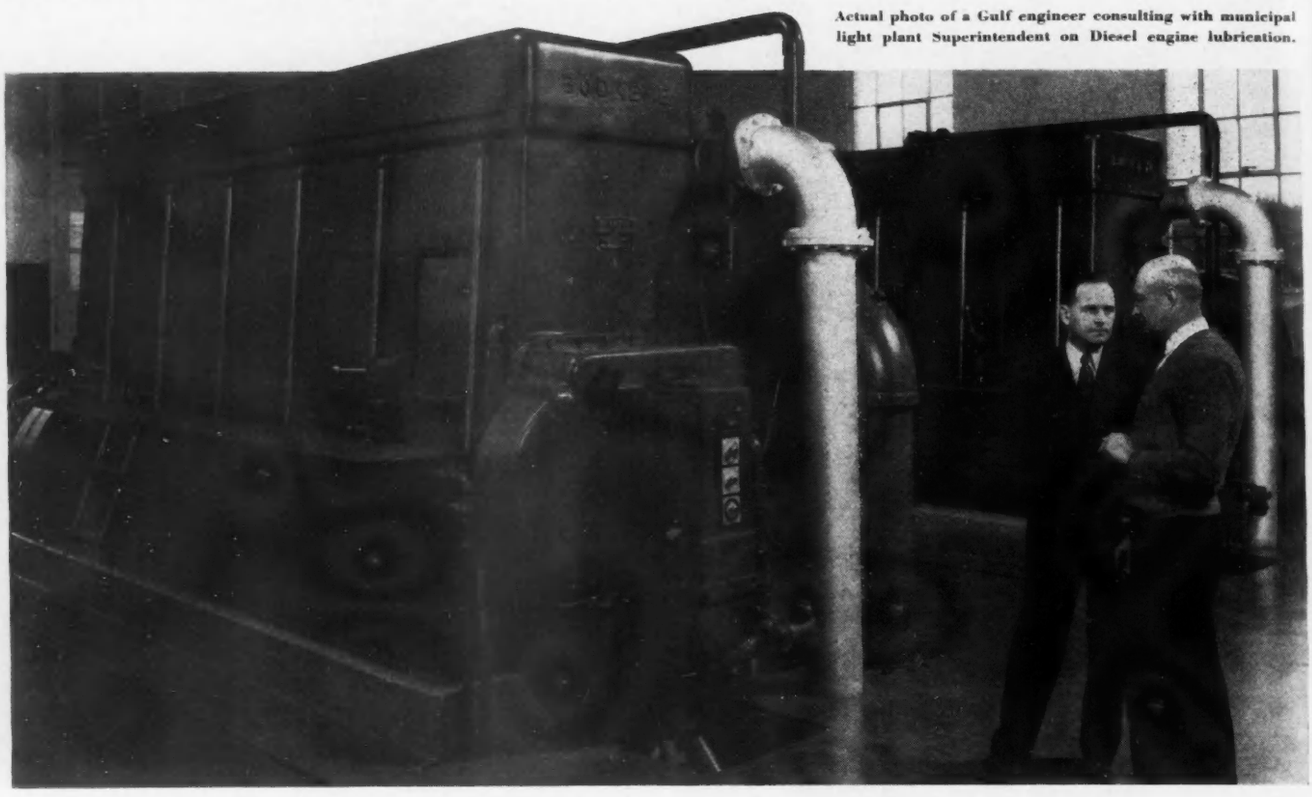
LIQUID FUSES

FOR DEPENDABLE SYSTEM AND EQUIPMENT PROTECTION—USE S&C FUSES

"Gulf Parvis Oil STANDS UP LONGER . . .

HELPS KEEP OUR OPERATING COSTS DOWN"

says municipal light plant Superintendent



Actual photo of a Gulf engineer consulting with municipal light plant Superintendent on Diesel engine lubrication.

"This quality oil performs better than any other Diesel lubricant we've ever used"

"WHEN we adopted Gulf Engineering recommendations and put Gulf Parvis Oil in service to lubricate our Diesels, we took a big step toward maximum operating economy," says this municipal light plant Superintendent. "Not only do we have very low maintenance expense with this quality Diesel lubricant, but our record of horse-power hours of service per gallon used is remarkable."

There are good reasons for the outstanding performance of Gulf Parvis Oil in the lubrication of large stationary and marine Diesel engines: Gulf Parvis Oil is especially manufactured from selected crude oils by the most modern refining methods. And built into this oil is *stability* and *stamina*—it stands up and provides full protection under the severe conditions encountered in Diesel engine service. Among its many advantages, Gulf Parvis Oil has a low carbon content—a safeguard against harmful carbon deposits from the lubricating oil.

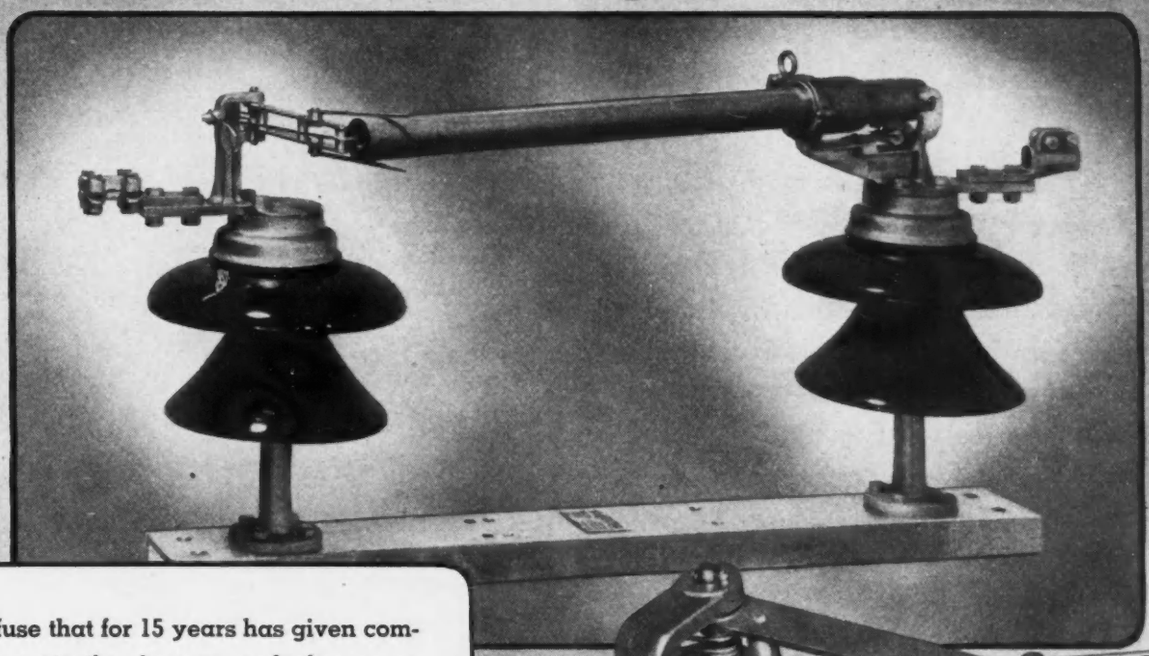
This higher quality Diesel lubricant—and the more than 400 other quality oils and greases in the Gulf line—are quickly available to you through 1200 warehouses located in 30 states from Maine to New Mexico. Write or 'phone your nearest Gulf office today.

GULF INDUSTRIAL LUBRICATION

GULF OIL CORPORATION
GULF REFINING COMPANY
Gulf Building, Pittsburgh, Pa.

Hi-Voltage Fuses

SENSITIVE TO TIME AND CURRENT



The fuse that for 15 years has given complete protection is now made for a new fuse link and with a throw-out mechanism.

Fuse Tubes and brackets are interchangeable with those in service.

An air gap is established in the line the instant the link melts.

Extremely fast clearing on heavy currents. The damage attending heavy shorts is practically eliminated.

Dependable operation under unusual conditions of light load.

Long life of links—Protected by energizing both ends of the tube and shielding the link.

Cost of fuse renewals is very low.

Present your next fuse problem to us or consult the Hi-Voltage Fuse Manual.

Hi-Voltage
EQUIPMENT COMPANY
2891 EAST 79th STREET CLEVELAND, OHIO

RESEARCH

FOR VICTORY— AND AFTER

Research in Simplex laboratories has been for many years one of our most important activities in connection with the production of Simplex wires and cables. Now research is doubly important because of the demand for unusual insulated conductors to meet military requirements and the necessity for conserving the scarce materials that are needed to produce them.

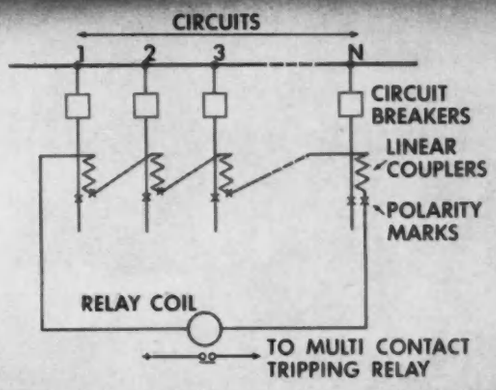
In overcoming the problems of continuous, twenty-four hours a day production under present conditions our Electrical, Chemical and Physical Laboratories are making a most important contribution. It is a stimulating challenge and Simplex research activity has been stepped up as never before. Production must go on and the unusual specifications must be met.

Upon our laboratories rests the responsibility of leading the way in maintaining Simplex quality with rationed materials under difficult operating conditions. It becomes their job to make the best possible use of the raw materials we can get in the limited quantities in which they may be available to us. We have the satisfaction of knowing that anything achieved to meet today's conditions forms a sound basis for the better wires and cables of tomorrow and that many of the results already obtained have long-range as well as immediate values.

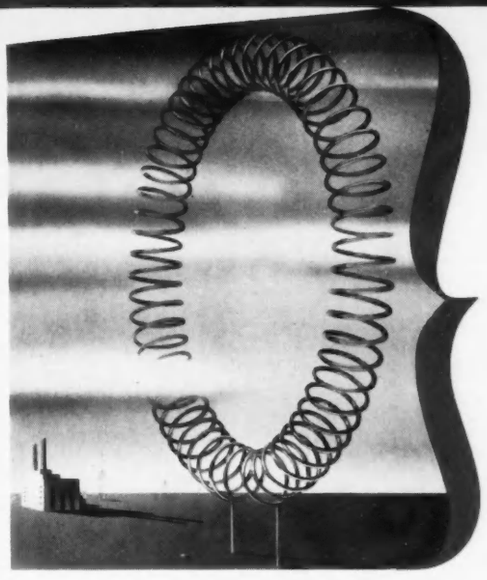
Simplex Wire & Cable Co., 79 Sidney Street, Cambridge, Mass.

Simplex WIRES and CABLES

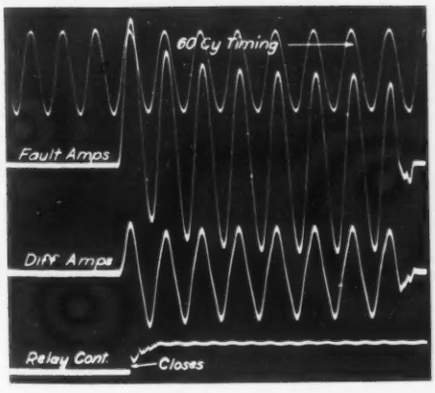
Quick Facts



on a new* system of bus protection



test facts—Thorough tests for performance on internal and external faults with and without d-c transients proved the theory. The oscillogram shows operation in less than one cycle for internal fault.



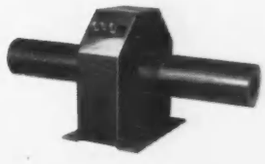
1. ***LINEAR COUPLER** bus protection is an accurate, reliable, simple, low-cost, fast-operating system of relaying.

2. **NO IRON—NO SATURATION.** Large current transformers are eliminated. The Linear Coupler is a circular air core inductance coil. There is no iron core to saturate.

3. **SIMPLE, RELIABLE.** Simple in theory. Easy to set. Easy to test. No restraining coils. Minimum wiring. Operates in one cycle.

4. **RELIABLE, SENSITIVE.** Free from transient effect—operates on a-c values only. System uses simple overcurrent type relays. Phase relays can be set for 1/17th of maximum phase fault current. Ground relays can be set for 1/17th of maximum ground fault current.

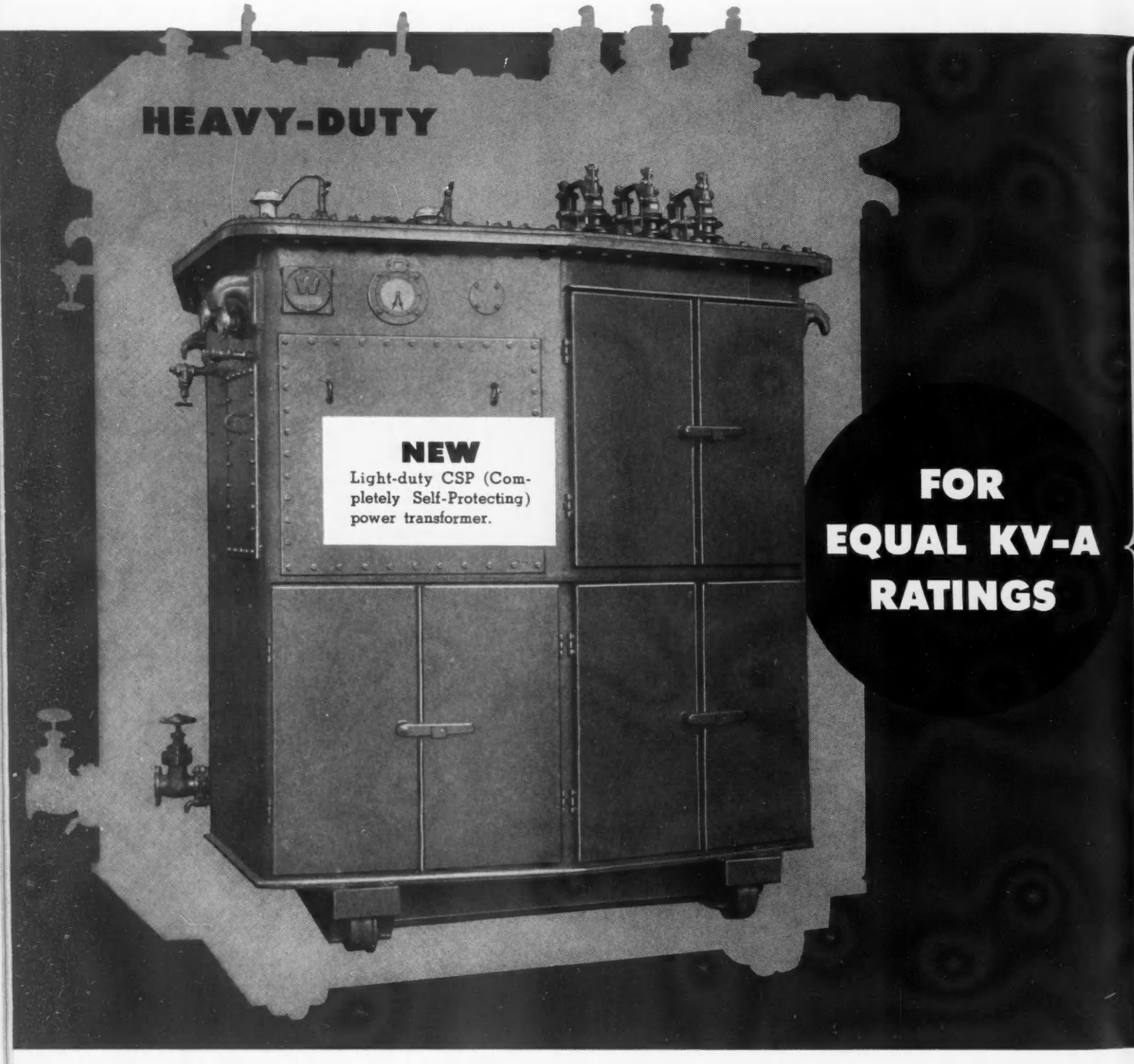
5. **COMPACT, LOW IN COST.** Available as a system, Linear Coupler bus protection is applicable to both old and new generating stations. Couplers are compact, easily installed in existing current transformer space.



J-40327

Westinghouse

New! CSP



Parade of "extras"—In these advertisements you will find information on products and product development which offer values beyond the conventional types of transmission and distribution equipment—information to help you get more power on the job quickly. Watch this space in future issues.

Power Transformers

- SMALLER
- LESS WEIGHT
- LOWER COST
- GREATER FLEXIBILITY
- ALL CSP FEATURES
  INCLUDING STANDARDIZATION
  - Complete lightning protection
  - Complete overload protection
  - Complete line lockout protection

FOR LIGHT-DUTY FEEDERS
300 TO 1,000 KV-A
. . . AT LOWER COST

Because today's rapidly changing industrial loads demand a greater flexibility of application and economy in power transformers, Westinghouse has developed a new CSP (Completely Self-Protecting) Power Transformer —a unit which for the same rating is smaller, costs less and can be applied most economically to light-duty feeders. It has all the standardized features of heavy-duty Westinghouse CSP Transformers—including Hipersil* Core and Loading by Copper Temperature—with the exception of a 50,000 kv-a instead of a 100,000 kv-a breaker and minor adaptations for light-duty feeder application.

Easier to move from job to job, the new CSP permits quick adjustments in load distribution. Lower in cost than any other equivalent installed transformer substation for the same capacity, it permits the economical use of more power transformer installations with savings in copper and reduction of feeder losses. Results—better service continuity—better voltage regulation—lower costs all around.

For complete information, call your Westinghouse office. Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

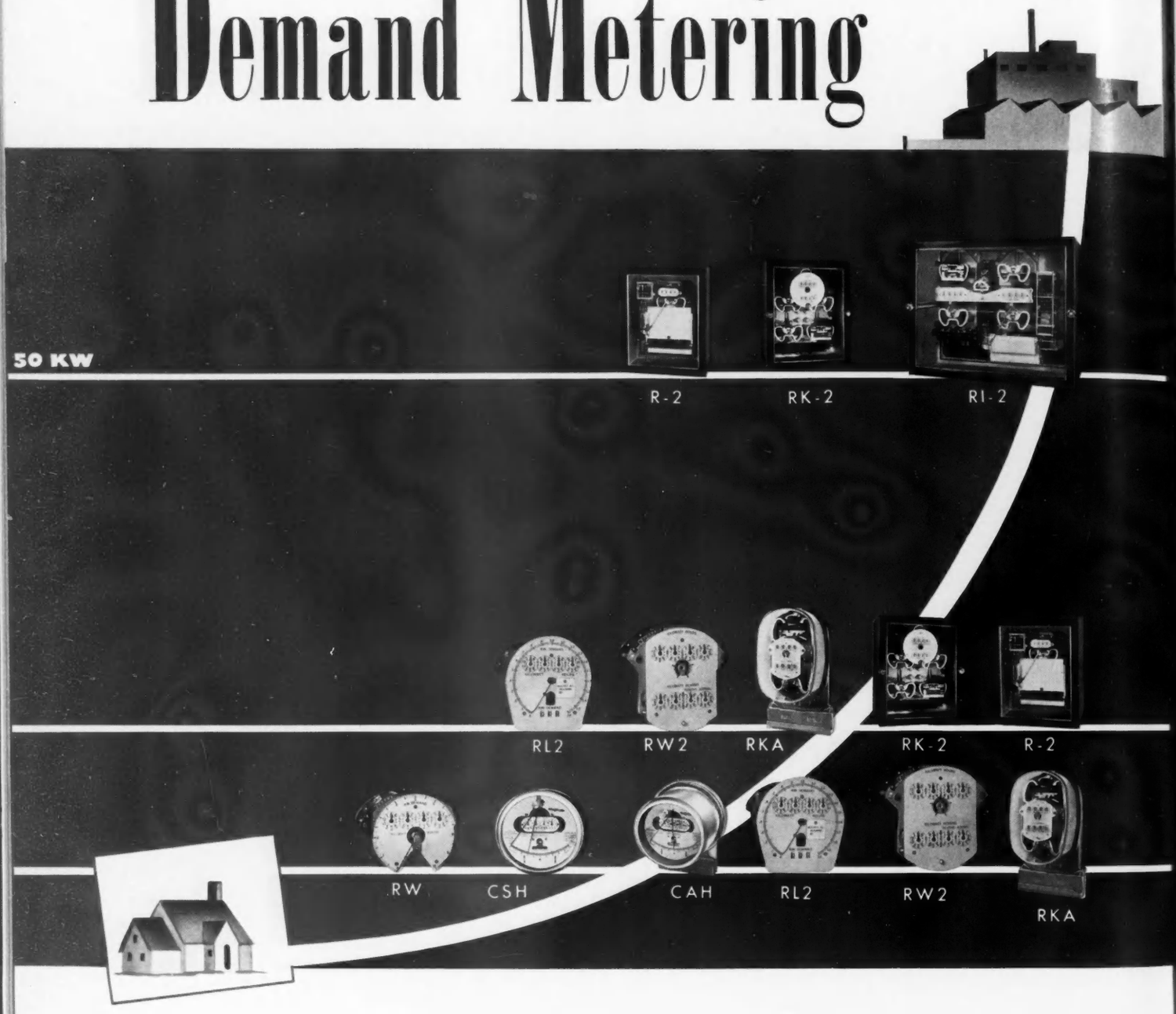
J-70365

*Registered trade-mark, Westinghouse Electric & Mfg. Co., 1934, for an exclusive HIgh PERmeability SILicon steel which carries ⅓ more flux.

WESTINGHOUSE

Westinghouse

Demand Metering



for the **full range** of loads

No longer is the sound economy of demand metering limited to big loads where more expensive equipment is justified.

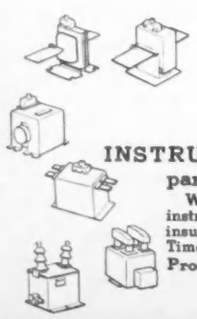
Today, Westinghouse equipment, including the RKA and RKS for kv-a demand on small single-phase loads and the CAH and CSH thermal kw demand meters for still smaller loads, now makes demand metering practical all down the line.

Whatever your requirements may be—kw or kv-a demand indicating, graphic or totalizing, single-phase or polyphase—Westinghouse has the meter to give you the information you need with maximum accuracy at low cost. Write for complete information. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., Department 7-N.

• • •

Meters today are not only required as measuring devices but are essential for conservation of electrical energy output and defense materials during the emergency.

J-40323



INSTRUMENT TRANSFORMERS—
partners in Long Time Accuracy

Westinghouse provides a complete line of instrument transformers designed and built to insure your receiving the full benefit of the Long Time Meter Accuracy.

Products of Transformer Div., Sharon, Pa.

Westinghouse

Don't Let RUST Strangle Your Turbines!

RUST is a deadly enemy of production that attacks without warning. But it need not catch *you* napping. Drain and refill your turbines now with new, proved, service-tested Shell Turbo Oil . . . the turbine oil that meets all 3 vital requirements of modern turbine lubrication:

RUST PREVENTION
SUPERIOR OXIDATION STABILITY
MINIMUM FOAMING TENDENCY

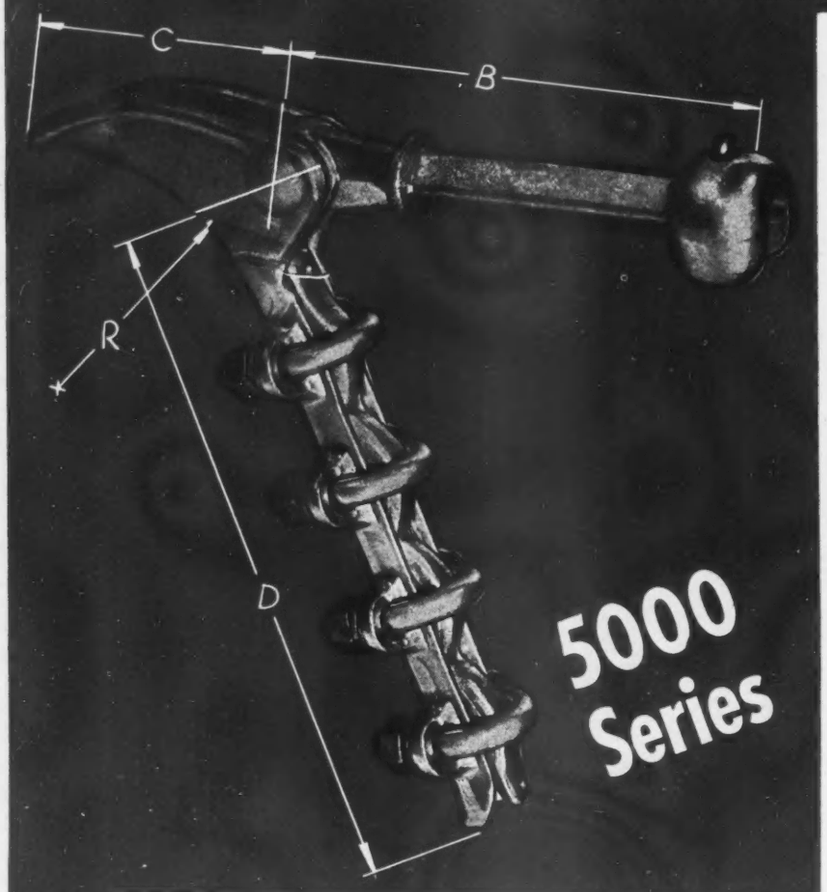
You're taking a chance if your turbine oil does less. Why not call in Shell today?

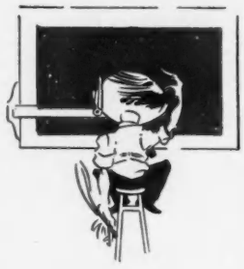
SHELL

***Keep your turbines on the job with* RUST-PREVENTIVE**

SHELL TURBO OIL

DESIGNING A TRANSMISSION LINE?





We can help you on CONDUCTOR STRAIN CLAMPS

Although BTC CLAMPS and HI-LINE HARDWARE are sold exclusively through the Insulator Manufacturers, we welcome cooperation with the Transmission Engineer in his selection of these important items.

The following essential data will enable us to offer the right Conductor Strain Clamps—

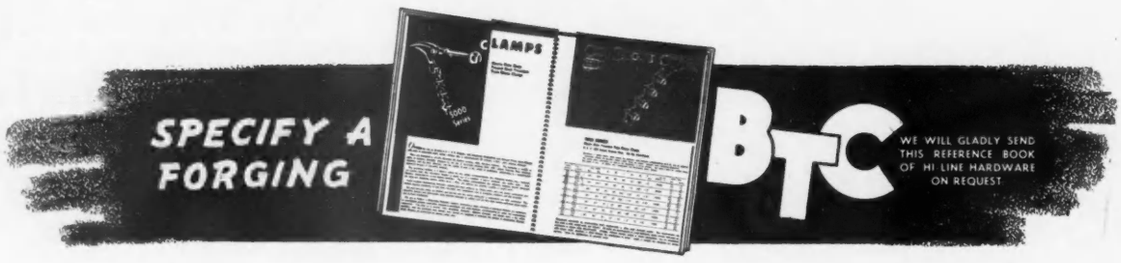
Conductor Material—Copper, A.C.S.R. or other Composites
Conductor Manufacturer
Conductor Type, Design Number or Stranding —Standard Concentric Stranding, or the newer "Hollow Copper" Expanded Diameter types such as General Cable Type HH, Anaconda I-Beam Core, Copperweld Composite Type S or V, Phelps-Dodge Stranded-Tube Core, or similar cables. In the case of "Hollow Copper" Types, some Cable Manufacturers have approved the use of Snubbing or Quadrant Type Strain Clamps — others prefer and generally supply Straight-Line Compression Strain Clamps—Consult your Cable Manufacturer on this one.

Conductor Diameter and Ultimate Strength

Liners — The use of soft copper or aluminum liners in Clamp bodies and keepers is recommended, especially on "Hollow Copper" and A.C.S.R. conductors. Concentric Stranded Copper is generally dead-ended in unlined Clamps. Copper and aluminum are critical war-winning materials. Consult your Cable Manufacturer on this liner question.

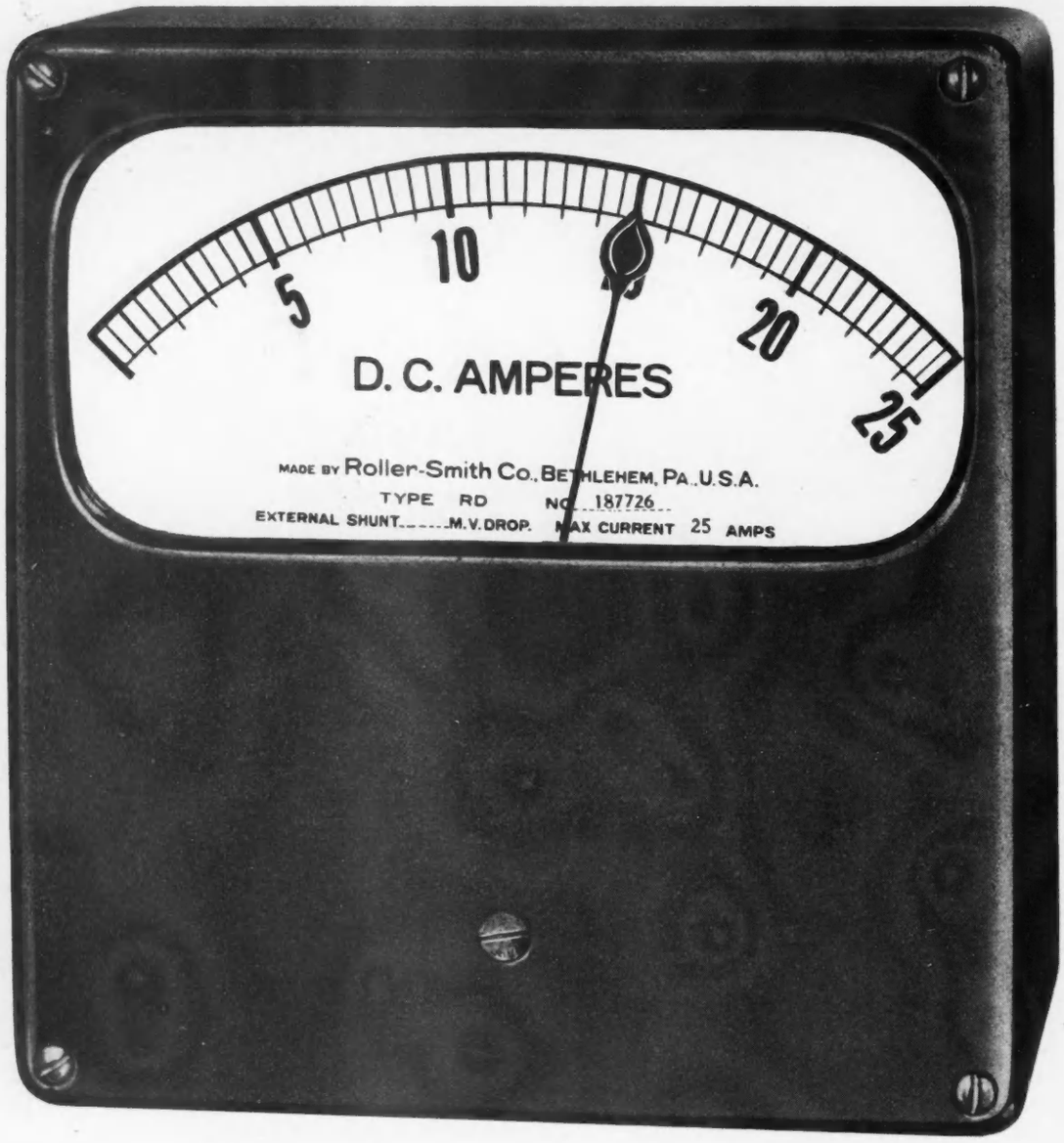
Why not tear out this page and file it for future reference?

The Brewer-Titchener Corporation, Cortland, New York



Air Might TO WIN THIS FIGHT
Four tons of bombs can be carried by this 4-Engine Bomber of 4800 horsepower. Somewhere within it, Chromel resistance wire is doing a useful job. This use of Chromel is just typical of the many ways in which this nickel-chromium alloy is going into war production. But gladly do we all give up our electric irons and toasters in exchange for anything to help win this fight. . . . Meanwhile it's good to know that Chromel heating elements last and last.
Chromel
NICKEL CHROMIUM
HOSKINS
CHROMEL
ELECTRICAL HEATING ELEMENT
WIRE
HOSKINS MANUFACTURING COMPANY • DETROIT, MICH.

Can You Read This Dial
FROM 15 FEET?



From what distance can *you* clearly see the numbers and scale divisions on a Roller-Smith switchboard instrument?

Hand drawn on lithographed metal, and with a scale length of 5½ inches, the dials on these instruments have been accurately read by persons with normal vision, at a distance of 15 feet. The advantages of such visibility to a busy station attendant are obvious.

Readability, however, is just one feature of Roller-Smith switchboard instruments. 1% accuracy . . . overload capacity of 30 times normal . . . improved temperature characteristics . . . more effective damping . . . and 750 volt insulation are others found in the new design. Get complete information today.

TRY THIS TEST

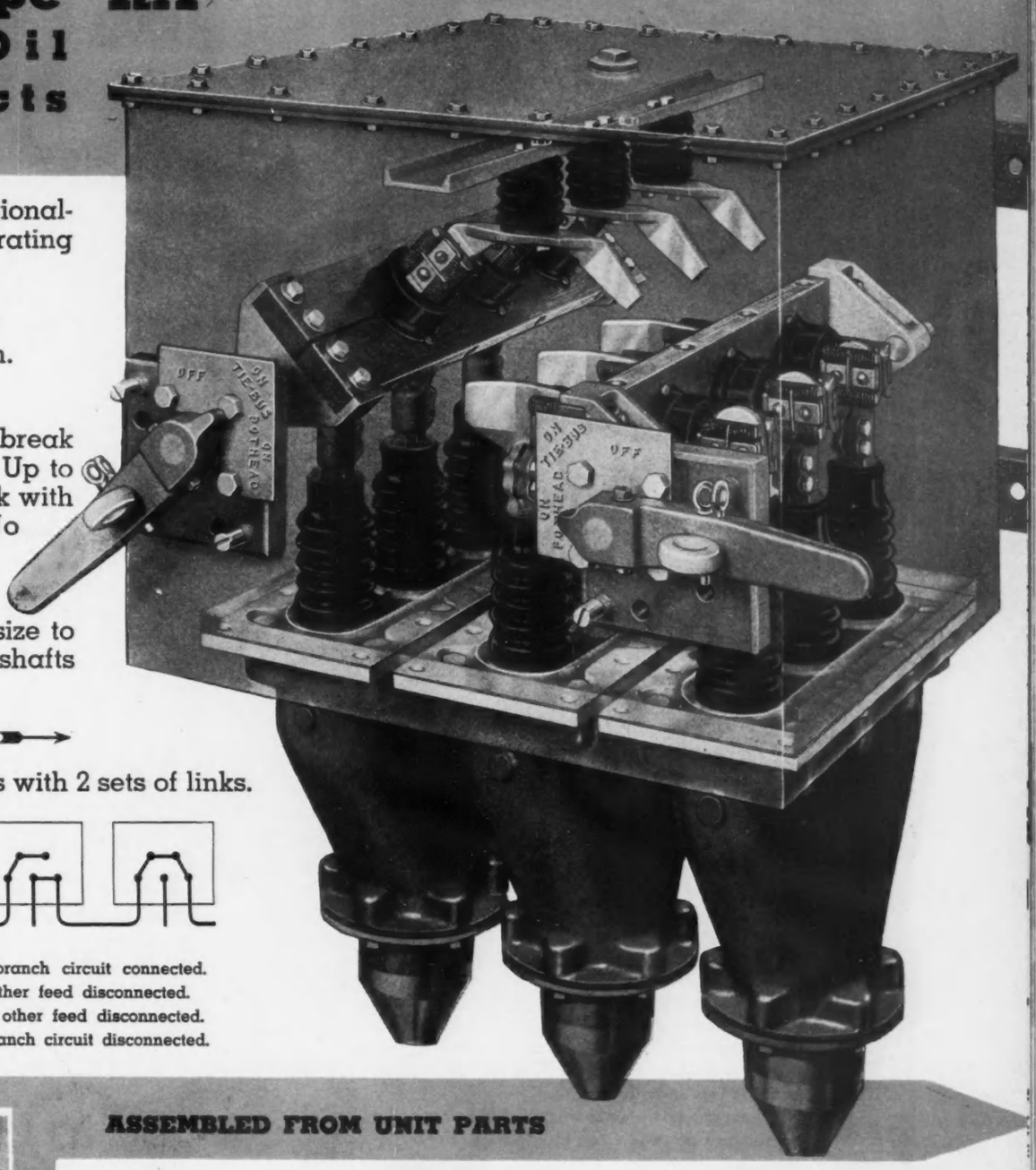
The instrument on this page has been reproduced full size. Place it at eye level and back away until the scale divisions become hazy. Then measure the distance at which your vision is effective.

Electrical Measuring and Protective Apparatus

ROLLER-SMITH COMPANY BETHLEHEM, PENNA.

Switchboards • Metal Enclosed Switchgear • Electrical Instruments
Indoor and Outdoor Oil Circuit Breakers • Air Circuit Breakers

Quickly isolate underground cable circuits with G & W Type "RA" Subway Oil Disconnects



Simple and safe sectionalization by merely operating external lever arms.

No covers to remove.

No seals to be broken.

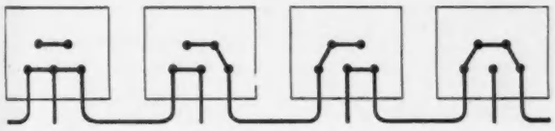
No links to unbolt.

Full 400 ampere load break with 7500 volt units—Up to 100 ampere load break with 15000 volt units—No load break with 23 Kv. and 34.5 Kv. units.

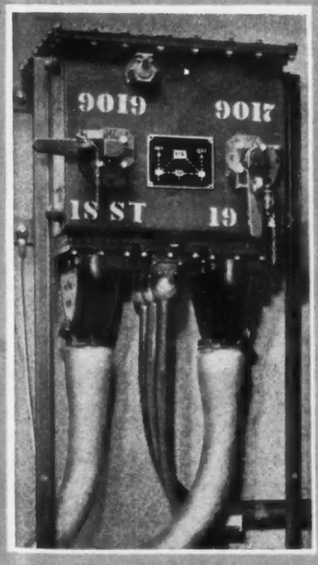
Oil filled tanks keep size to minimum—operating shafts perfectly sealed.

G & W TYPE "RA-2" ➡

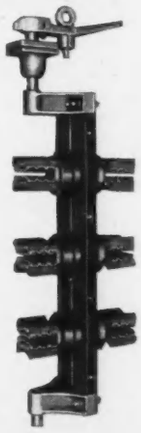
4 different connections with 2 sets of links.



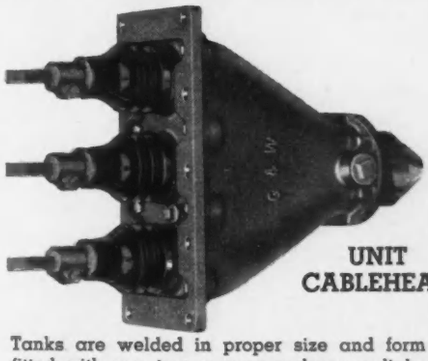
1. Loop or feed through with branch circuit connected.
2. Feed branch from left with other feed disconnected.
3. Feed branch from right with other feed disconnected.
4. Loop or feed through with branch circuit disconnected.



ASSEMBLED FROM UNIT PARTS

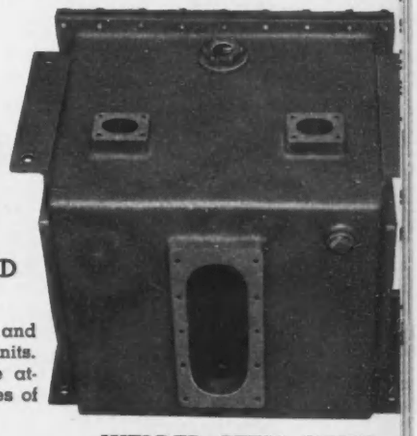


ROCKER ARM LINKS



UNIT CABLEHEAD

Tanks are welded in proper size and form and fitted with one, two or more rocker arm link units. Cableheads in straight or elbow shapes are attached to the bottom or to the bottom and sides of the tank to complete the assembly.



WELDED STEEL TANK

G & W ELECTRIC SPECIALTY CO.

7780 DANTE AVENUE **CHICAGO, ILLINOIS**

Also made in Canada by POWERLITE DEVICES, LTD., Toronto.

Four Ways To Buy MOTORS!

1. ***BEING SOLD.*** This isn't really "buying."
2. ***ORDERING BY TRADE-MARK.*** Unsound, because all well-known motors are <u>not</u> alike.
3. ***ORDERING BY HABIT.*** Costly, because motors and power needs have changed since old habits were formed.
4. ***BUYING BY COMPARING MOTORS.*** The <u>sure</u> way to get top value.

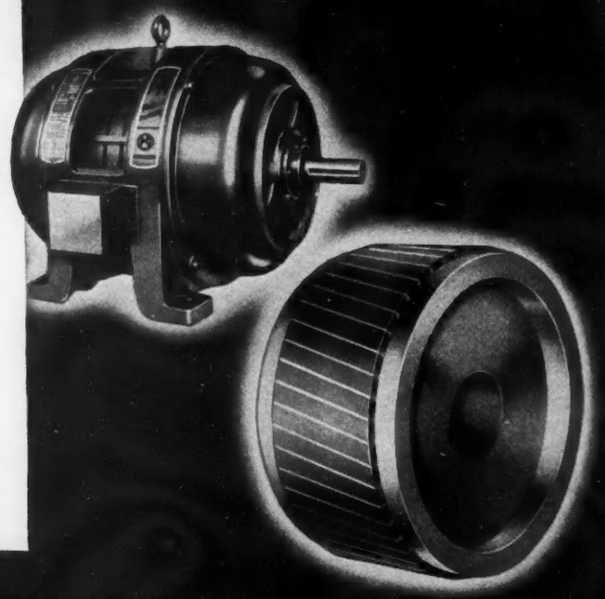
WHICH WAY DO <u>YOU</u> BUY MOTORS?

BECAUSE we believe you know motor quality when you see it, we highly recommend Method 4—*buying by comparing motors.*

Yes, proud as we are of the Fairbanks-Morse trade-mark, we ask you to *look beyond the trade-mark* . . . to ignore sales talks and buying habits . . . and look at the motors, construction point by point.

Compare the exclusive Fairbanks-Morse Copperspun Rotor, for instance, with any other type of rotor. Then ask yourself whether you want windings centrifugally cast of COPPER, or of some less suitable metal.

A post card or telephone call will bring you a demonstration . . . let you look beyond the trade-mark at the rotor and at the many other construction superiorities which make F-M Motors stand up better under today's production tempo. Fairbanks, Morse & Co., Dept. F27, 600 S. Michigan Ave., Chicago. Branches and service stations throughout the United States and Canada.



Copperspun

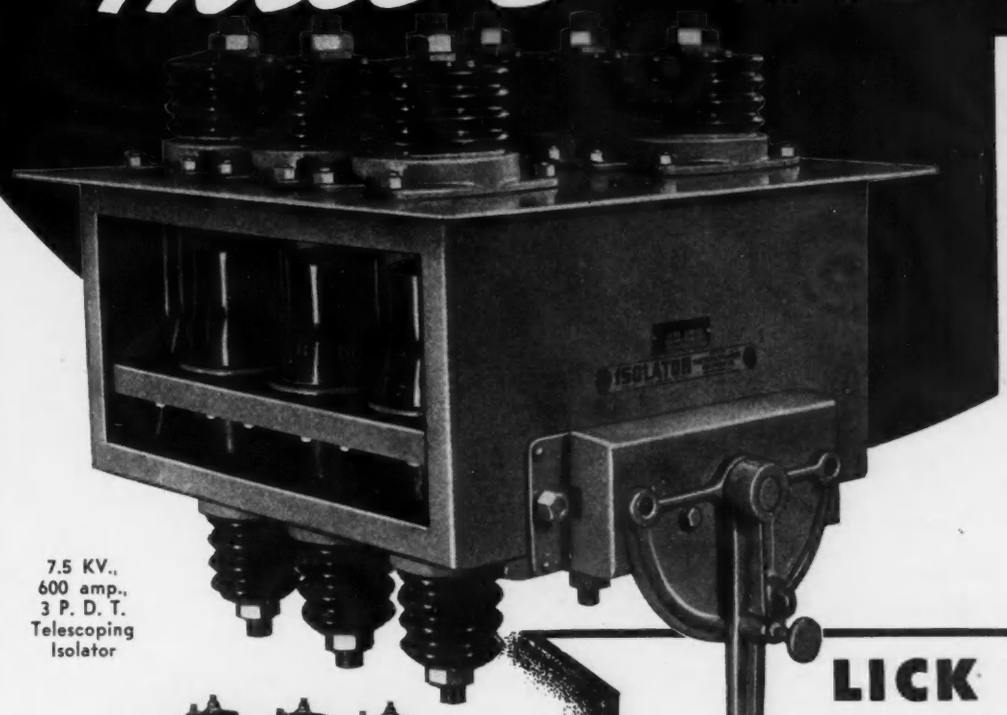
FAIRBANKS·MORSE F-M MOTORS

DIESEL ENGINES ELECTRICAL MACHINERY MAGNETOS RAILROAD EQUIPMENT WASHERS-IRONERS STOKERS
PUMPS MOTORS FAIRBANKS SCALES WATER SYSTEMS FARM EQUIPMENT AIR CONDITIONERS

SMALLER CUBICLES · · LESS STEEL

when you install

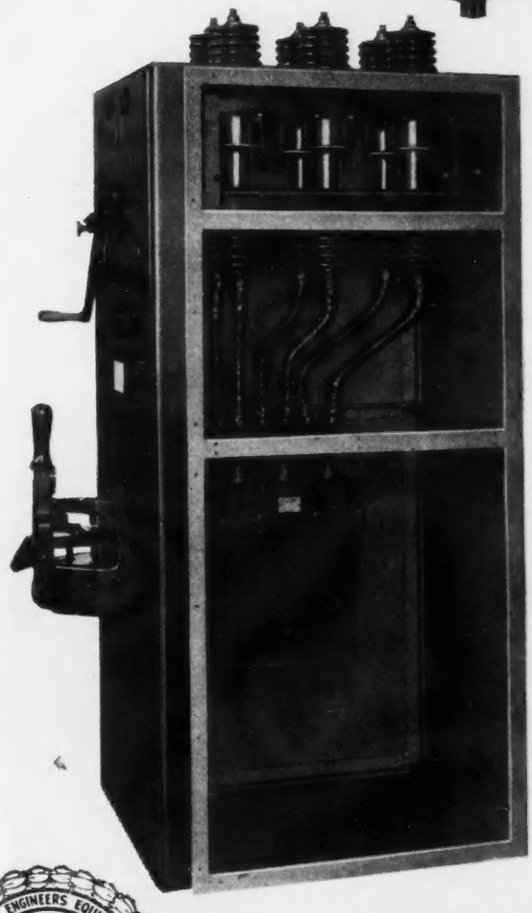
"Three E" ISOLATORS



7.5 KV., 600 amp., 3 P. D. T. Telescoping Isolator

The opening and closing of the ISOLATOR occurs through telescoping action of the contacts and current carrying parts as well as insulation. The installation space, therefore, need be no more than the actual overall dimensions of the ISOLATOR. There is no knife blade action that requires larger housing. Because of this telescoping action, it is possible to design the ISOLATOR into a most compact unit so that present cubicle and mounting structure facilities could be utilized and still make possible added disconnect advantages.

LICK SCARCITIES *and still keep engineering standards* HIGH



★ To install Isolators you use a minimum of strategic materials—you get important space savings because of unique telescoping of insulator and current-carrying parts—you save in steel because cubicles and switchboards can be smaller—you save in insulator cost as there is no need for bus supports—regular barrier forms are eliminated because of the barrier action of the telescoping insulators—you save accident losses as live parts of Isolators are completely shielded—you save installation time as it is only necessary to insert four mounting bolts, clamp connections and tape.

Isolators can be supplied for outdoor service. Where space is at a premium on outdoor substations they can be dependably used as oil circuit breaker disconnects.

Standard Units readily fit into the majority of indoor and outdoor uses as the Isolator is built in a great variety of sizes and shapes—for use in switching cabinets, switching tables, cubicles, outdoor switch houses, etc.

Don't go to the expense of increasing the size of your disconnecting cells until you have discussed the application, of an Isolator, to your disconnecting needs.

ELECTRICAL ENGINEERS EQUIPMENT CO.
MELROSE PARK, ILLINOIS

To industries converting to war production where magnet wire and coils are vital . . .

Anaconda Can Help!...

Anaconda's Central West plants still have unfilled capacity on magnet wire and coil production . . . *for war work.* In addition to these facilities, they have experienced personnel to help solve problems you might have with this phase of manufacture.

Here is an opportunity to release your time so that it can be devoted to other important problems. Our sales offices, located in all principal cities, are near you. Call today. A representative will be glad to discuss your problem.

GENERAL OFFICES: 25 Broadway, New York City
CHICAGO OFFICE: 20 North Wacker Drive
Subsidiary of Anaconda Copper Mining Company
Sales Offices in Principal Cities

ANACONDA
from mine to consumer
This familiar trade-mark symbolizes the best efforts of modern research and production.

These Improved Insulations Are Now Available Nylon—Vitrotex—and Formvar

The commercial development of Nylon and Vitrotex insulations is in part the result of Anaconda research . . . research that continues with redoubled effort producing new products for war work. Of course, when peace comes, the benefits of this research will be ready for industry everywhere.

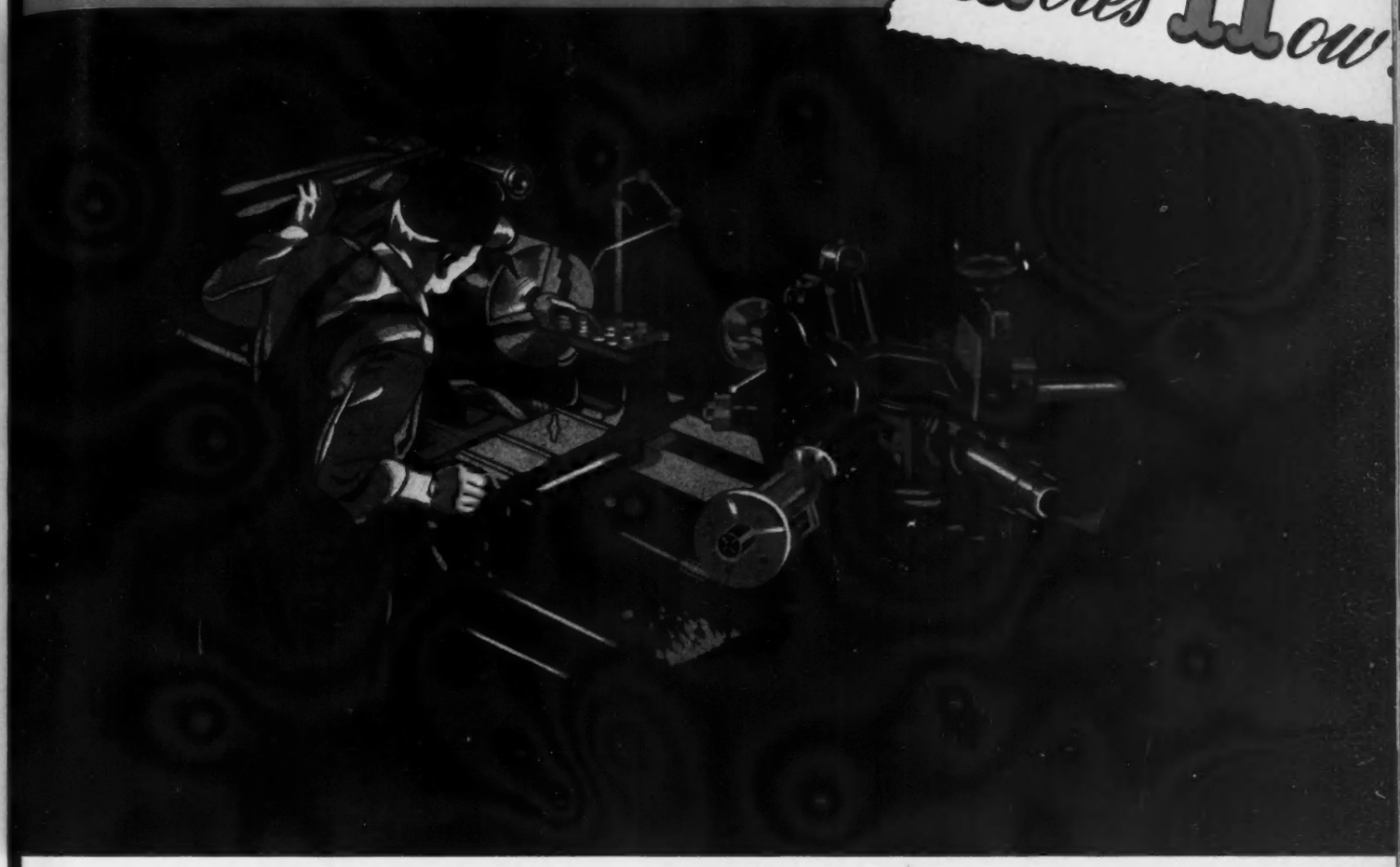
42263

Magnet wire and coils

ANACONDA WIRE & CABLE COMPANY

Your job is to deliver the power

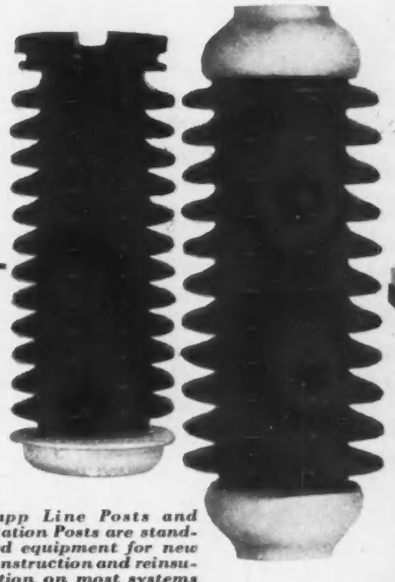
Here's How



The specification "Lapp Insulators" means fewer service interruptions

WITH plants, large and small, drawing on your lines for 24-hour Production for Victory, you cannot risk the crippling effect of service interruptions. That means equipment adequate to supply the demand and secure for operation under all conditions. In insulators for transmission lines and substations it means high-voltage units that don't puncture or crack unexpectedly, that don't give up when lightning hits the line, that don't fracture when kids shie stones at them, that *do* go on through dirt and rain and cold and heat, delivering the power. A great many experienced engineers will tell you that it means Lapp Line Posts and Station Posts, the units with an 11-year service record to prove that they can handle their job best.

Lapp



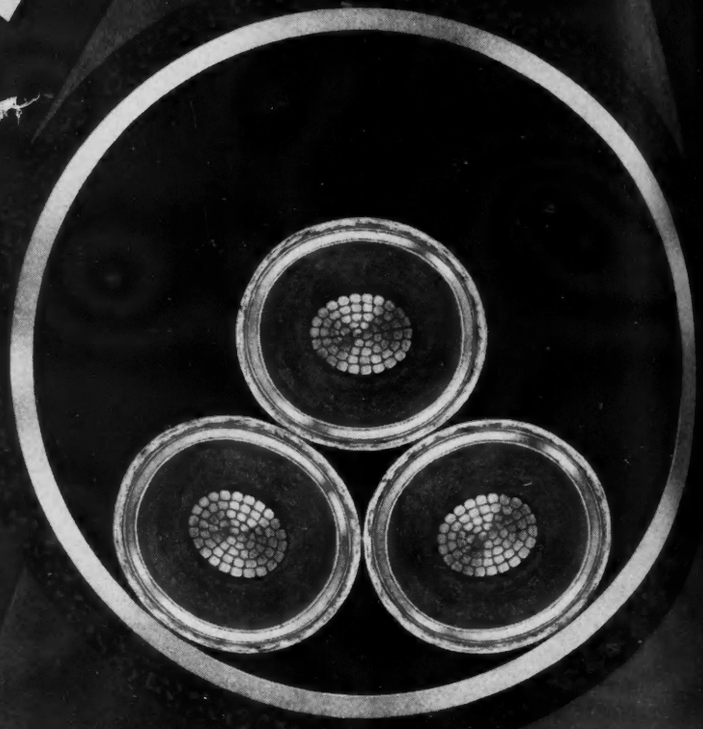
Lapp Line Posts and Station Posts are standard equipment for new construction and reinsulation on most systems where they have been given a chance to prove their worth.

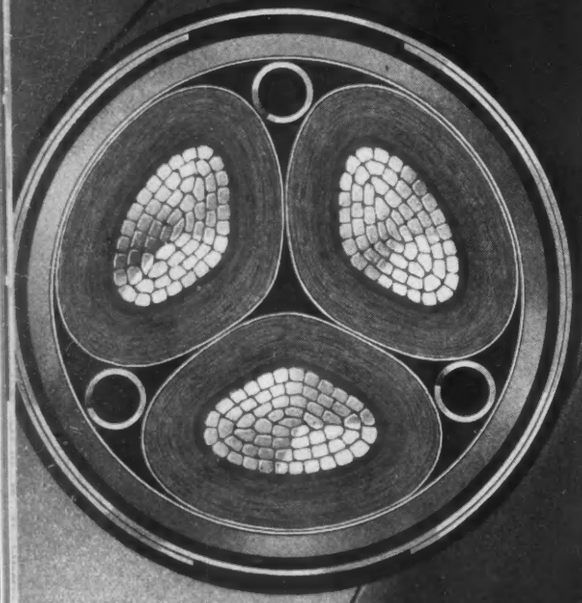
LAPP INSULATOR COMPANY, INCORPORATED • LE ROY, N. Y.

GENERAL CABLE

GENERAL CABLE

GENERAL CABLE

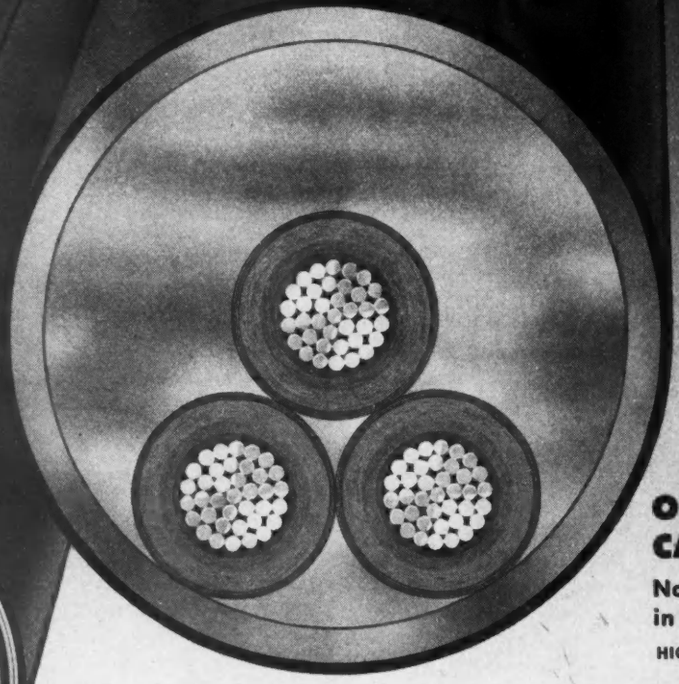




**COMPRES-
SION CABLE**

**Leaded Cable in
Steel Pipe**

HIGH GAS PRESSURE



**OILSTATIC
CABLE**

**Non-Leaded Cable
in Steel Pipe**

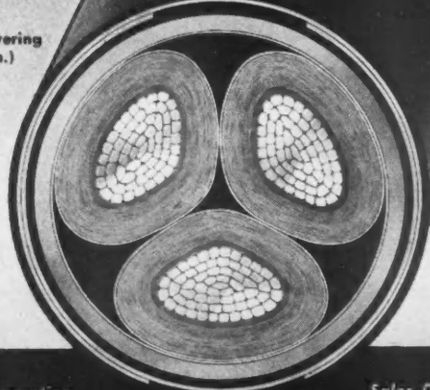
HIGH OIL PRESSURE

OIL-FILLED CABLE

**Leaded Cable with
Channels**

LOW OIL PRESSURE

**(Shown with protective covering
for direct-earth installation.)**



TYPE H CABLE

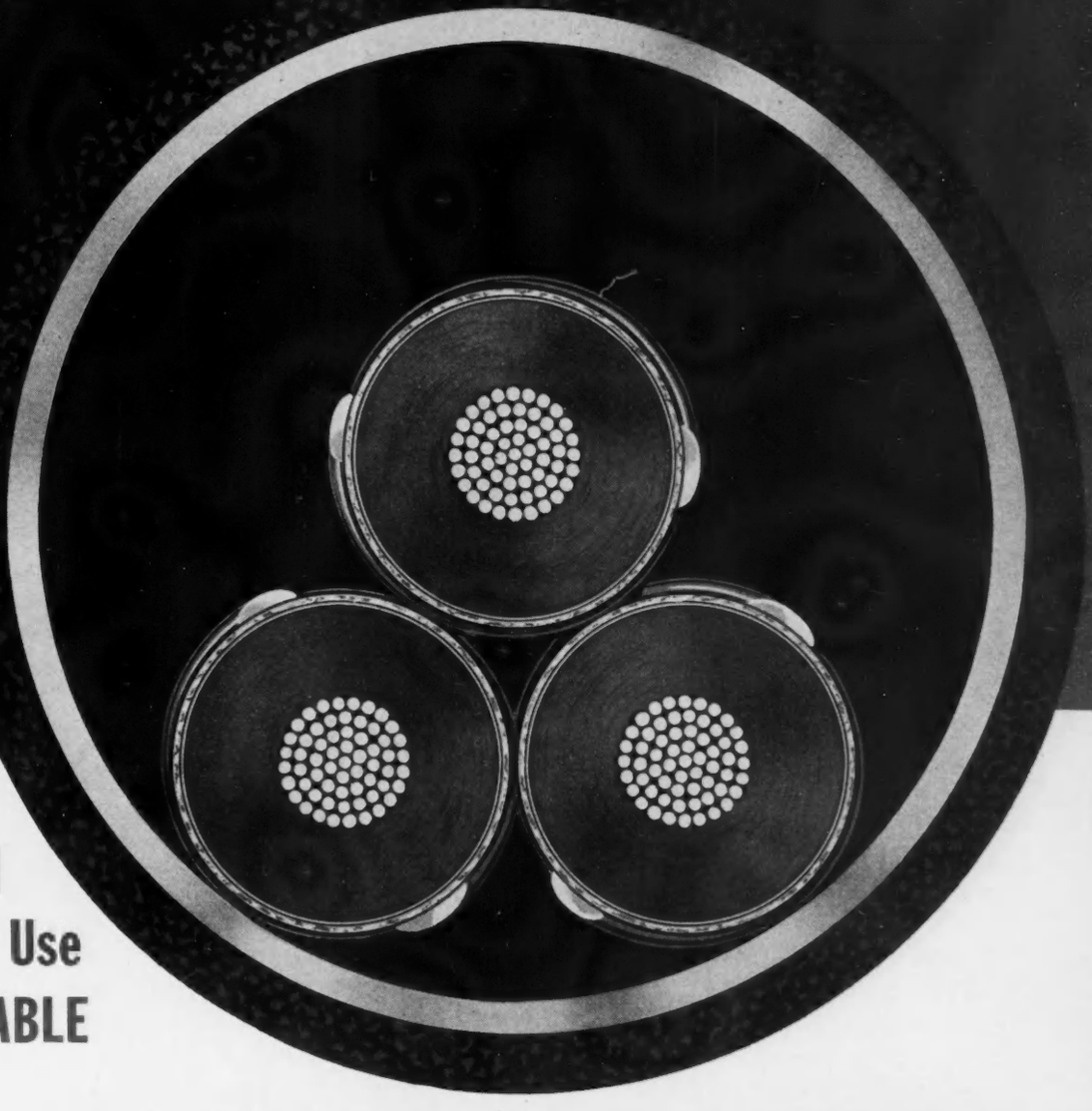
**(Shown with protective covering
for direct-earth installation.)**

General Cable Corporation *Sales Offices:* ATLANTA • BOSTON • BUFFALO • CHICAGO • CINCINNATI • CLEVELAND • DALLAS • DETROIT
HOUSTON • KANSAS CITY (MO.) • LOS ANGELES • NEW YORK • PHILADELPHIA • PITTSBURGH • ROME (N.Y.) • ST. LOUIS • SAN FRANCISCO • SEATTLE • WASHINGTON (D.C.

And Now...

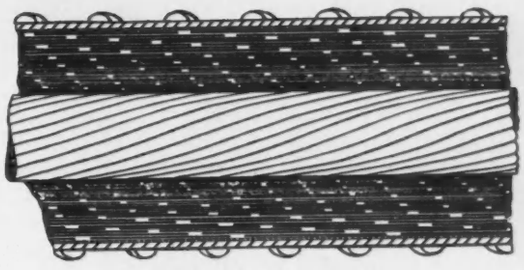
HIGH-PRESSURE

GAS-FILLED CABLE



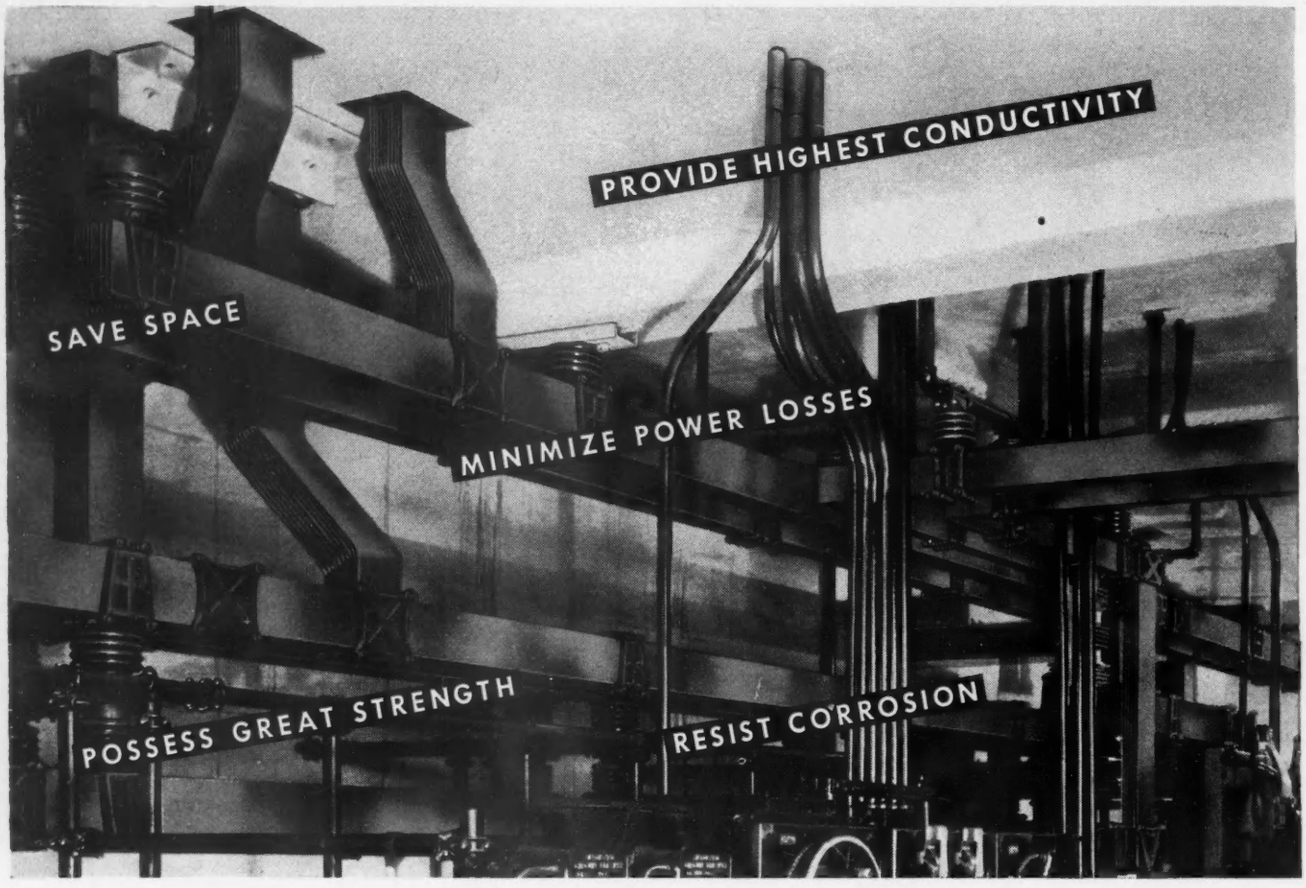
Developed and Introduced to Commercial Use by GENERAL CABLE

A paper insulated cable in which nitrogen under high pressure fills the oil-free gas spaces formed between the edges of pre-impregnated paper tapes. These tapes are graduated in thickness so that the thinnest gas spaces will be next to the conductor where stress is highest, as shown in diagram on right. Installed non-leaded in a welded corrosion-protected steel pipe laid directly in the earth · · · · General Cable engineers will be glad to place at the disposal of those interested their ample data on design and performance of this and other types of high voltage cables.



LONGITUDINAL SECTION.

GENERAL CABLE



Bus conductors of copper have ALL these advantages

Because of its high conductivity and consequent low current losses, copper has always been the most widely used material for bus conductors.

To these advantages may be added such further qualifications as high thermal conductivity, high strength, high resistance to corrosion and ready availability of accessory equipment. It is for these reasons that copper lends itself to more efficient bus constructions.

Wherever modern electrical engineering practice dictates bus construction embodying structural strength, low ohmic and reactance losses or effective heat dissipation, the range of copper bus shapes made by The American Brass Company will meet every requirement, for, in addition to a complete line of copper bus bars of rectangular shapes, this Company makes high conductivity pipe and tube, stranded cables and many special shapes.

Of particular interest to electrical engineers are the ventilated busses made from channels, angles, tubes and rectangular copper bars. Information, including the suggestions of our Technical Department on various bus conductors and assemblies, is available on request.

A new edition of our Bus Conductor Booklet, C-25, is just off the press. Copy on request. 4291

Anaconda Copper

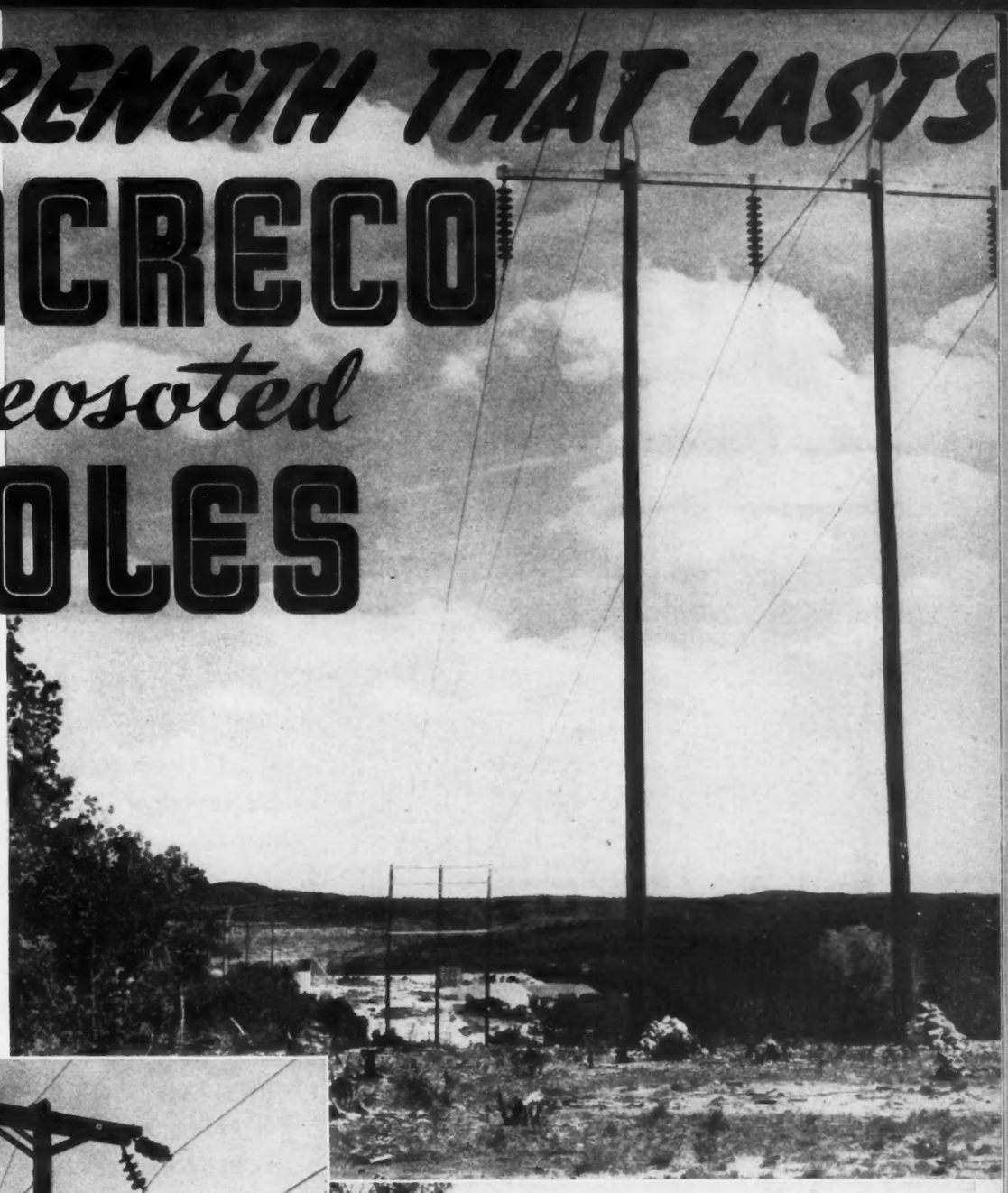
ANACONDA
from mine to consumer

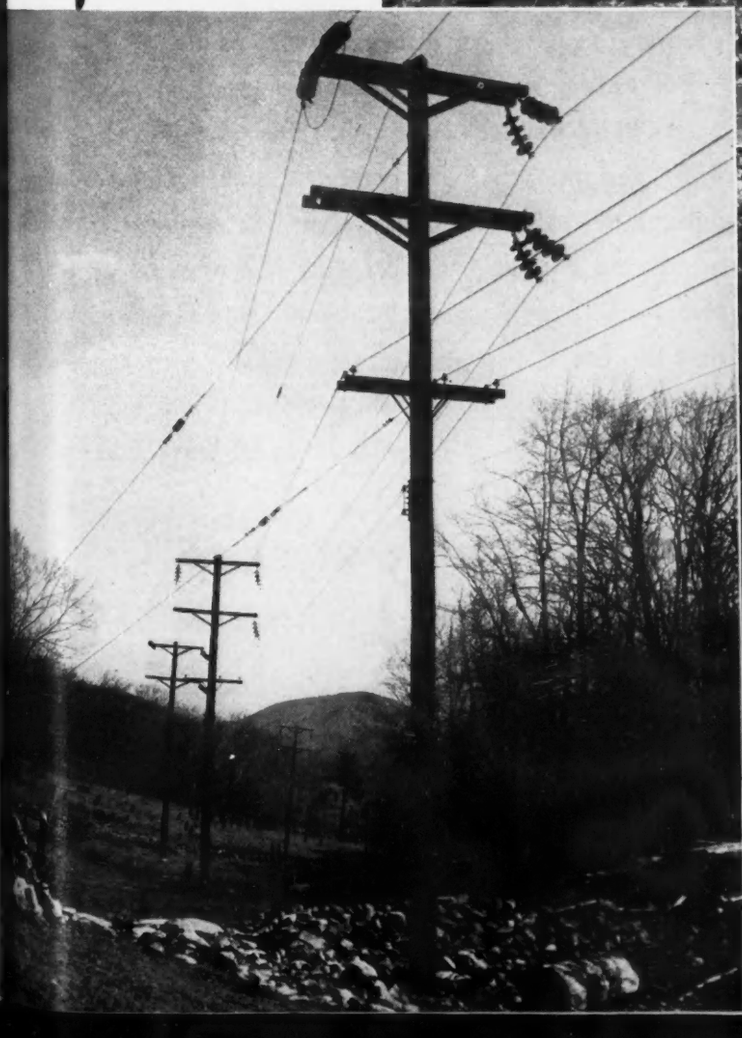
THE AMERICAN BRASS COMPANY • General Offices: Waterbury, Connecticut
Subsidiary of Anaconda Copper Mining Company • In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ontario*

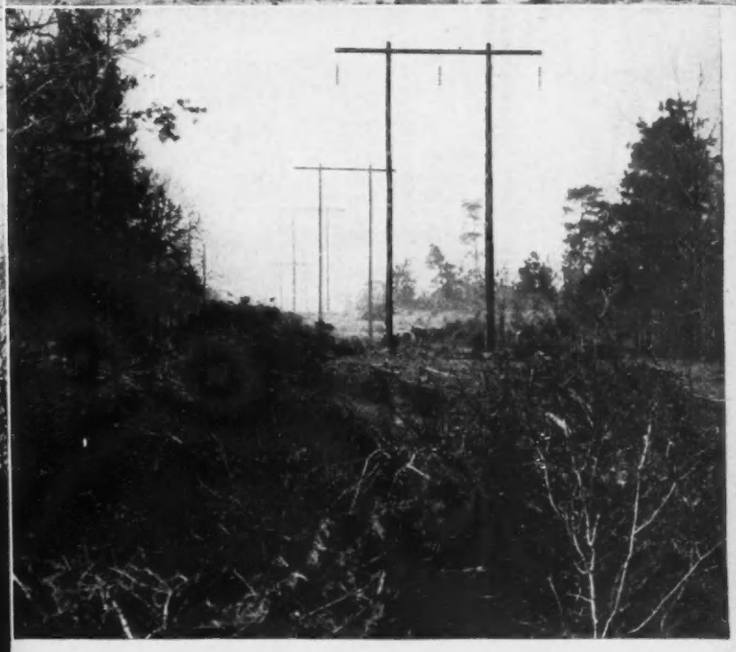
for STRENGTH THAT LASTS

AMCRECO *Creosoted* POLES

Combine long SERVICE *and* ECONOMY *of upkeep for profitable operation!*







AMERICAN CREOSOTING COMPANY

INCORPORATED

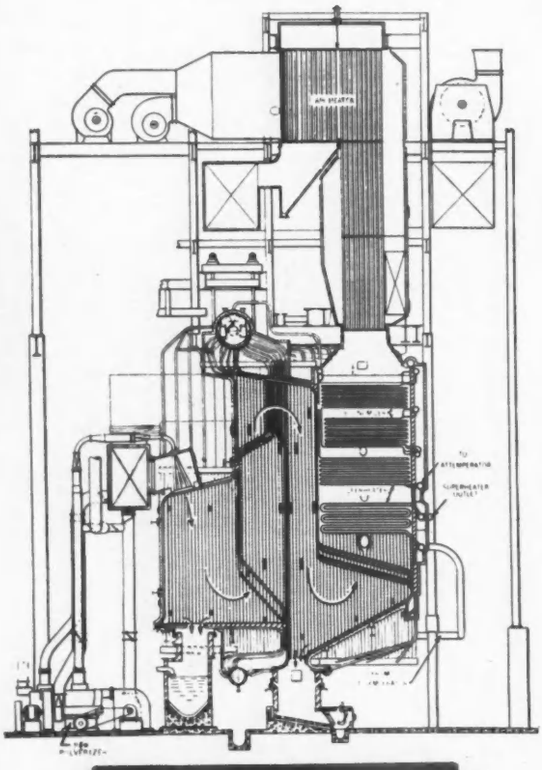
COLONIAL CREOSOTING COMPANY INCORPORATED

AMCRECO LOWRY PROCESS CREOSOTED WOOD

GEORGIA CREOSOTING COMPANY INCORPORATED

ADDRESS INQUIRIES TO CHICAGO, ILL., OR LOUISVILLE, KY.

Not the number -but the Job each



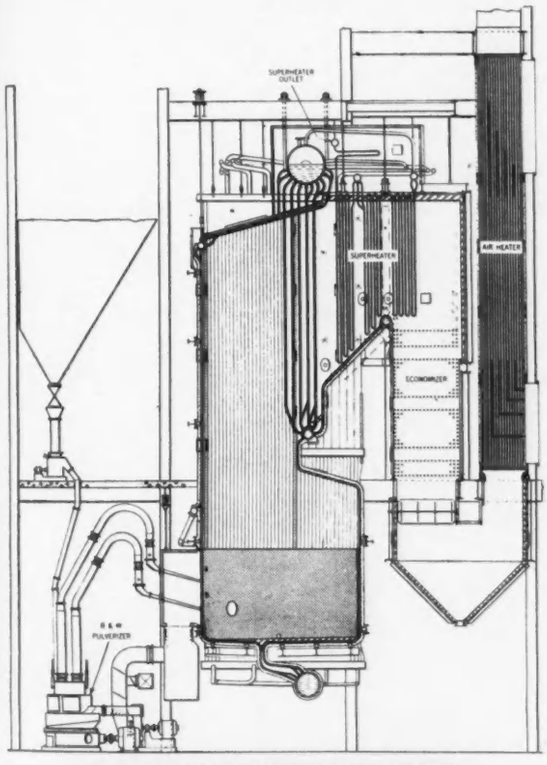
OPEN-PASS BOILER

B&W is naturally proud of the statistics covering the Radiant, Open-Pass, and Integral-Furnace Boilers sold in 1941 for central-station service, which, for example, show that 71 per cent were purchased by utility companies already having boilers of these designs in service or on order—definitely indicating the acceptance of these designs. Twelve of the boilers will have individual steam-generating capacities of 500,000 lb. per hr. and over, thirty-five are designed for pressures of 900 psi or higher, and thirty-two for total steam temperatures of 850 F. or above.

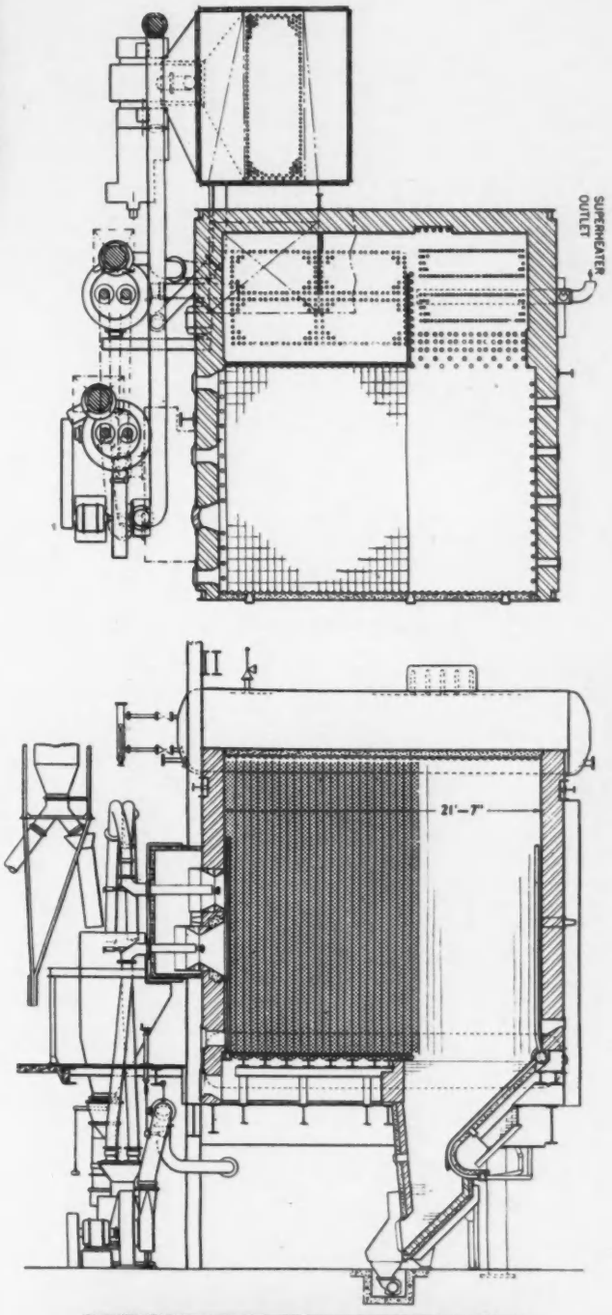
But greater pride is taken in the fact that each application is a pointed example of the adaptability of B&W designs to exacting central-station requirements, through the use of existing designs, the adaptation of an existing design, or the creation of a new design to meet specific engineering problems. And into each is built the broad experience of the B&W Company—experience impossible to write into specifications or to show on blueprints, but is inherent in all B&W Boilers.

THE BABCOCK & WILCOX COMPANY
85 LIBERTY STREET, NEW YORK

and size will do



RADIANT BOILER

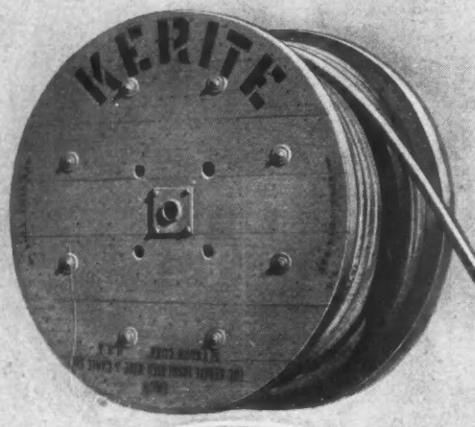


INTEGRAL-FURNACE BOILER

The Navy "E" Award to the Barberton Works for production achievement is "an honor not lightly bestowed and one to be cherished."

BABCOCK & WILCOX

G-217T



KERITE

in over three-quarters of a century of *continuous production*, has spun out a record of performance that is *unequalled* in the history of insulated wires and cables

1942
Another Year added *to the* Performance Record *of* KERITE

THE KERITE INSULATED WIRE & CABLE COMPANY INC
NEW YORK CHICAGO SAN FRANCISCO

"KEEP 'EM FLYING!"

You may have heard that Hubbard and Company has gone "all out" for the duration. You may also have formed the opinion that such being the case, Hubbard Pole Line Hardware might have become one of those war-time "hard to get" commodities.

You may be sure that we have turned over to war production, every facility that the U. S. Armed Forces have needed, and are working day and night to "Keep 'em flying." Otherwise, we would not have earned the All-Navy "E" for production, recently awarded to us.

But you may also rest assured that we are doing everything in our power to take care of our regular customers, as witness the huge stocks pictured above. In peace times our operation runs five eight-hour shifts per week. In these war times we are running twenty-one eight-hour shifts per week. Yes! we are working hard to "Keep 'em flying" but we likewise pledge every effort to you, our customers, to keep the freight cars rolling to meet your needs.

HUBBARD AND COMPANY

PITTSBURGH . . . CHICAGO OAKLAND . . . CALIFORNIA

"HANG THE LOAD ON HUBBARD HARDWARE"

"2 Ships A DAY"

This is not an empty phrase. It sets a goal to be reached in our shipbuilding effort. It means the difference between Victory early and Victory late. It may mean the difference between Victory and Defeat.

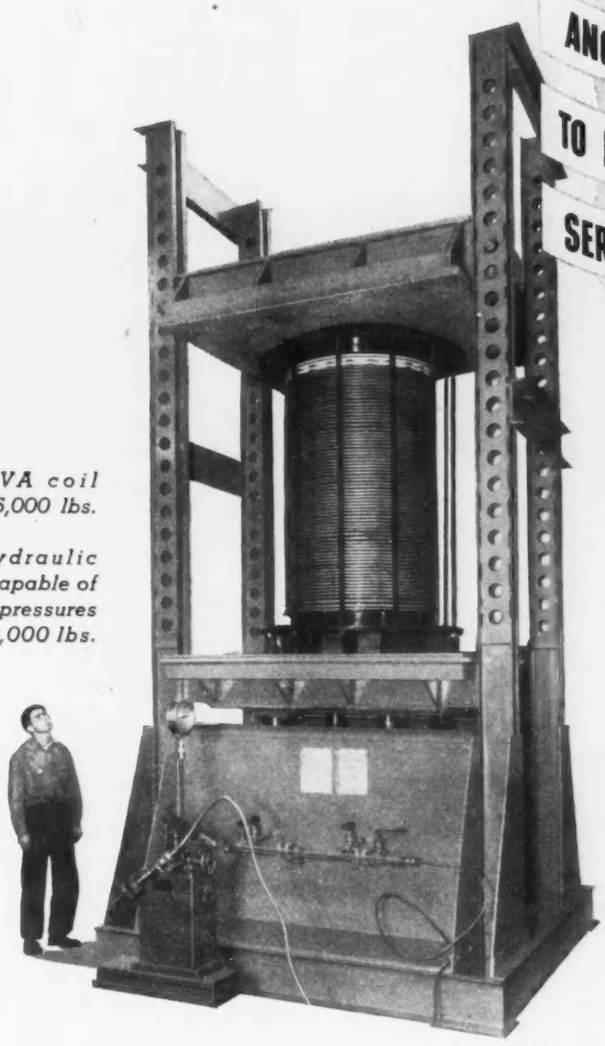
"Two ships a day" also means that the enormous quantity of equipment for fitting ships for operation must be produced and delivered to the yards as needed. Our contribution to the Victory Shipbuilding Program is production of insulated wires and cables of Simplex quality to help maintain the "Two ships a day" schedule.

Insulated cables for communication, control, and power, have an important place in every modern ship and Simplex insulated wires and cables of various types are being supplied in huge quantities so that shortage of cables need not slow down the "Two ships a day" program.

Simplex Wire & Cable Co., 79 Sidney Street, Cambridge, Mass.

Simplex WIRES and CABLES

ANOTHER *Pennsylvania* INNOVATION
TO INSURE UNFAILING TRANSFORMER
SERVICE FOR WAR INDUSTRIES . . .



5000 KVA coil under 125,000 lbs. pressure. This Hydraulic press is capable of exerting pressures up to 600,000 lbs.

The fundamental principles of building transformers to withstand short circuits are as follows:

1. The coils and all insulation must be dried sufficiently to make sure that no shrinkage will take place when the transformer is in operation or is under a short circuit.
2. The dry coils must be pre-compressed to such an extent that no further compression can take place under the most severe short circuit. This definitely precludes any possibility of the coil stack moving or distorting under short circuit.
3. After drying and pre-compressing, the coils must be treated in such a manner that they are self-supporting and will maintain their pre-compressed and pre-shrunk shape when mounted on the core.
4. The final step is to provide sufficiently strong supports at the top and bottom of the group of coils to keep the coils in their pre-compressed shape.

Every Pennsylvania Transformer of the Helical and Pancake type is constructed on these principles.

A Sure Way of Building Transformers

THE ability of the coil to maintain its shape under the prescribed pressure is your guarantee that the transformer will withstand short circuits.

Pennsylvania
TRANSFORMER COMPANY 808 RIDGE AVENUE • N. S., PITTSBURGH, PA.

S., Soviet Agree | *Germans Claim* | Year

a 75-ton kick in the panzers!

Confidence is the strong and good cousin of that horrid word complacency. Most Americans are confident, few are complacent today. Confidence is our heritage, bequeathed to us by the pioneers, and nurtured by headlines of industrial marvels.

From the day when the Flatiron Building made news, to the colossal statistics of Grand Coulee, we have become firmly convinced that no task is too great for our vast construction industry.

That conviction is justified. A year before Pearl Harbor Sunday was anything more than a gleam in treacherous oriental eyes, our engineers and contractors were moving earth faster than it had ever been moved before . . . in preparation for projects which since have made our skyscrapers and giant bridges look like mere trial heats.

You know part of the story. We can't tell it all . . . complete aluminum plants built between Christmases . . . whole farms transfigured into bomber plants in less time than elapses between crops of corn . . . great shipyards in operation today on inlets that were frog ponds when the "Battle of Britain" was at its height.

How were these miracles of construction performed?

We can't call it genius. Germany, in particular, has many great engineering minds, yet the entire Axis is outstripped by our capacity to do big jobs fast.

We can't explain it by just calling it skill and experience. The new shipyards prove that . . . our skilled and experienced shipbuilders were absorbed by navy construction long ago. Yet we have met each new quota of cargo shipbuilding. Deep in our hearts we all know industry will meet whatever quota may be needed however impossible that may seem now.

▶ Some of these cargo ships and shipyards are being built by landlubbers . . . by men who knew nothing of the sea, but who were hell on reading blueprints and at designing and operating complicated machines.

There are several reasons why ordinary Americans become Supermen when faced by "fantastic" construction jobs.

▶ The first reason is the intrepid spirit of the management and men of American construction. With a slide rule in his hand, the most meek and stoop-shouldered of American engineers becomes a high adventurer. He is willing to gamble that the machines and men at his command can lick anything this side of the fourth dimension.

The second reason is motive power. The leaders of our construction industry have always had the guts to gamble the cost of big machines to do big jobs. Probably the rest of the world combined cannot match our array of power shovels, scrapers, bulldozers, compressors, welders, motors and engines for moving and moulding earth, water, steel and stone.

The third reason is men. A shovel weighing 75 tons needs a "75-ton mind" at the control levers . . . American labor takes to machinery as a co-ed takes to "swing."

The fourth reason is versatility. The construction industry is used to turning corners at high speed . . . to an organization that has built railroads, cathedrals, bridges, and movie palaces, making a munitions plant in a hurry just means more men, more machines and more night work, and more of that good American ingenuity.

In recognition of the miracle of war production—accomplished through the cooperation of American management and labor with the W. P. B. . . . . this advertisement is published by the McGraw-Hill Network of Industrial Communication.

SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT : "OPPORTUNITIES" : EQUIPMENT
BUSINESS : : USED OR RESALE

UNDISPLAYED —RATES— DISPLAYED

10 CENTS A WORD. MINIMUM CHARGE $2.00
Positions Wanted (full or part time salaried employment only), ½ the above rates payable in advance.
Box Numbers—Care of publication New York, Chicago or San Francisco offices count as 10 words.
Discount of 10% if full payment is made in advance for 4 consecutive insertions.

Individual Spaces with border rules for prominent display of advertisements.

The advertising rate is $7.25 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

An advertising inch is measured ⅞ vertically on one column, 3 columns—30 inches—to a page.

NEW ADVERTISEMENTS received by 10 A. M. Monday will appear in Saturday's issue, subject to limitations of space available.

POSITION VACANT

(See also "Selling Opportunity" Offered)

FIRE PROTECTION ENGINEER and Inspector. Permanent position open in Middle West with large industrial fire insurance organization. Previous knowledge in this work not necessary. Applicant must be a technical graduate with manufacturing or engineering experience, and possess a good personality. Several months training with full pay will be given. Send photo with letter. P-52, Electrical World, 330 W. 42nd St., New York, N. Y.

EMPLOYMENT SERVICE

SALARIED POSITIONS — $2,500 to $25,000. This advertising service of 32 years' recognized standing negotiates for positions of calibre indicated. Procedure individualized to your personal requirements. Retaining fee protected by refund provision. Identity covered. If salary has been $2,500 or more send for details. R. W. Bixby, Inc. 262 Delward Bldg., Buffalo, N. Y.

EXECUTIVE AND TECHNICAL MEN, Qualified candidate desiring $2,500 to $20,000 position may contact employers through our confidential services, established 27 years. The National Business Bourse, 20 W. Jackson Blvd., Chicago.

POSITIONS WANTED

ELECTRICAL ENGINEER — 18 years public utility engineering experience. At present Assistant-Chief Engineer of an eastern Utility. Licensed as a Professional Engineer in the State of New Jersey and Connecticut. Available only for a responsible engineering or executive position. PW-51, Electrical World, 330 W. 42nd St., New York, N. Y.

CHIEF SYSTEM OPERATOR, 15 years experience operating steam and Hydro plants and interconnecting transmission lines up to 114 k.v. wishes to make change. Southern states preferable. PW-53, Electrical World, 330 W. 42nd St., New York, N. Y.

SELLING OPPORTUNITIES

OFFERED—WANTED

Selling Agencies—Sales Executives
Salesmen—Additional Lines

OPPORTUNITY OFFERED

AGENT familiar with the selling of fine Insulating Varnish Wire Enamel. Electra Varnish Company, 99 Lockwood St., Newark, N. J.

J. L. HEMPHILL & CO. Inc.
ELECTRICAL ENGINEERS AND EQUIPMENT
1600-1604 53rd Street, North Bergen, N. J.
N. Y. C. Tel.: LOngacre 5-3227—N.J. Tel.: UNion 3-2600

MOTOR GENERATOR SETS

1—500-KW., 600 volt, General Electric synchronous.
1—100-KW., 250 v. Synchronous.
1—50 KW, 125/250 volt, G.E., squirrel cage
1—50-kw., 250-V., G.E., Sq. Cage.
2—35-kw., 125-volt, Electric Machy., squirrel cage.
1—25 KW, 125 volt, General Electric, squirrel cage
1—16 KW, 125/250 volt, Westinghouse, squirrel cage

TURBINES

3—1000-kw., 2300 volt, condensing.
1—500-kw., General Electric, 3 phase, 60 cycle, 480 volt bleeder.
1—300 KW, 2300 volt, Westinghouse, non-condensing.
1—300-kw., 3 phase, 60 cycle, 220 volt, General Electric, condensing.
1—200-kw., General Electric, condensing.

TRANSFORMERS

2—400 KVA, General Electric, 4150-240/480 volts.
4—300 KVA, Pittsburgh, 7800/440 volts.
3—200 KVA, Pittsburgh, 15,000/7500-110/220 V.
4—200-kva., Pittsburgh, 7800/200/110 volts.
3—150-kva., Pittsburgh, 6600/440 volts.
18—150-kva., G.E., 3 phase, 4150-120/208 v.
3—150-kva., G.E., 2400/120/240 volts.
6—100 KVA, Westinghouse, 13,200-250 volts.
3—50 KVA, Wagner, 4150-220 volts.
2—50 KVA, Pittsburgh, 15,000/7500/110/220 volts.
3—37½ kva., General Electric, 2400/240/120 V.
3—25-kva., Westinghouse, 440/220-220/110 volts.

MOTORS—3 PHASE, 60 CYCLE

No.	H.P.	R.P.M.	Volts	Type
1	720	360	440	G.E. Syn.
1	560	1200	440	G.E.
1	500	450	2300/4000	G.E. Sl. Rg.
1	400	514	440	West. Sl. Rg.
1	350	300	440	G.E. Sl. Rg.
1	350	100	220	G.E. Syn.
2	335	600	2200	G.E. Syn.
1	250	450	440	G.E. Sl. Rg.

VARIABLE SPEED 230 VOLT MOTORS

H.P.	R.P.M.	Type
2—100 HP, Electro Dynamic, 475/1375 RPM.		
90	470/940	G.E.
75	235/950	Burke
75	525/1050	E.D.
35	500/1500	G.E.
30	600/1200	West.
25	300/1200	G.E.
4— 20	400/1200	G.E.
3— 15	300/1200	G.E.

ENGINE SETS

13x15 Skinner Uniflow, 150/300 RPM, engine only
16x36, Hamilton Corliss, heavy-duty, with 165 KW. 3 phase, 220 volt General Electric Generator.
120 KW, G.E., 3 phase, 220 volt, with Ames uniflow engine.
50 KW, Westinghouse, 3 phase, 320 volt; Fairbanks engine.

Complete Line of A.C. and D.C. Motors and Generators

—TRANSFORMERS—

TRANSFORMERS WANTED

in operating condition or burnt out. Mail us list giving complete nameplate data and stating condition.

We Rewind, Repair and Redesign all Makes and Sizes
ALL TRANSFORMERS GUARANTEED FOR ONE YEAR
Write for Catalog No. 136-A

THE ELECTRIC SERVICE CO., INC.
"AMERICA'S USED TRANSFORMER CLEARING HOUSE"
STATION M Since 1912 CINCINNATI, OHIO

"TECHNICAL ABILITY and MANPOWER"

to do your

Electrical and Mechanical Designing!

Complete Plan Preparation—Specifications
Estimates—Installation Supervision
Industrial Plant Planning
Layouts—Production Systems, etc.
Ample Facilities—Maintained Schedules
Write—Wire or Phone

Equipment Engineering Associates
Telephone—ANDover: 3420-21
64 W. Randolph St. CHICAGO, Ill.

NEW and USED EQUIPMENT AVAILABLE

for

Power Plants, Sub-Stations, Transmission Lines and Construction

Send for new list . . . to

—APPARATUS EXCHANGE—

EBASCO SERVICES INCORPORATED, TWO RECTOR ST., NEW YORK, N. Y.

TRANSFORMERS—POWER and DISTRIBUTION

	KVA	Make	Ph.	Type	Voltages
1	1500	Whse.	3	OISC	26400–460
3	1000	G.E.	1	HKDD	13800–2300
3	300	Pitts.	1	OISC	2300–115/230
3	300	G.E.	1	H	13200–2300/575
3	333	Pitts.	1	OISC	13200–440
3	250	Maloney	1	C	13800/440/220
3	200	G.E.	1	HLLD	26400–115/460

M.G. SETS 3 PH. 60 CY.

1—1500 KW. Whse, 250 v. DC D 2100 hp. 2200/4400 v. syn. motor.
1—1500 KW. GE 600 V. D.C. to 2100 HP. 6600 v. 720 R.P.M. syn. motor, with exciter.
1—1000 KW GE 600 v. DC D 1400 hp. 2300/4000 v. Syn. Mator with exciter.
1—500 KW, G.E., 600 Gen. to 700 HP, 13200 v. syn. motor with exciter.

BELYEA COMPANY, INC.
51 Howell Street, Jersey City, N. J.

Your inquiry will have special value . . .

if you mention this magazine, when writing advertisers. Naturally, the publisher will appreciate it . . . but more important, this proof of active reader interest will demonstrate to the advertiser the usefulness of—and demand for—the vital service rendered by his advertising.

MOTOR GENERATOR SETS

2 Crocker Wheeler, AC motor, 125 HP, 208 Volts, 3 phase, 60 cycle, DC Generators, 75 KW, 125 volts, 600 A, complete with Allen Bradley starters, DC switchboard, complete.

ABRAHAM & STRAUS, INC.
420 Fulton Street Brooklyn, N. Y.
Attention: Purchasing Department

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PROFESSIONAL SERVICES 122

■

SAVE TIME

To save time and money—your time and your money—that's the purpose of the many products and services advertised in this issue of Electrical World. Check through the advertising pages for information that can be of direct benefit to you.

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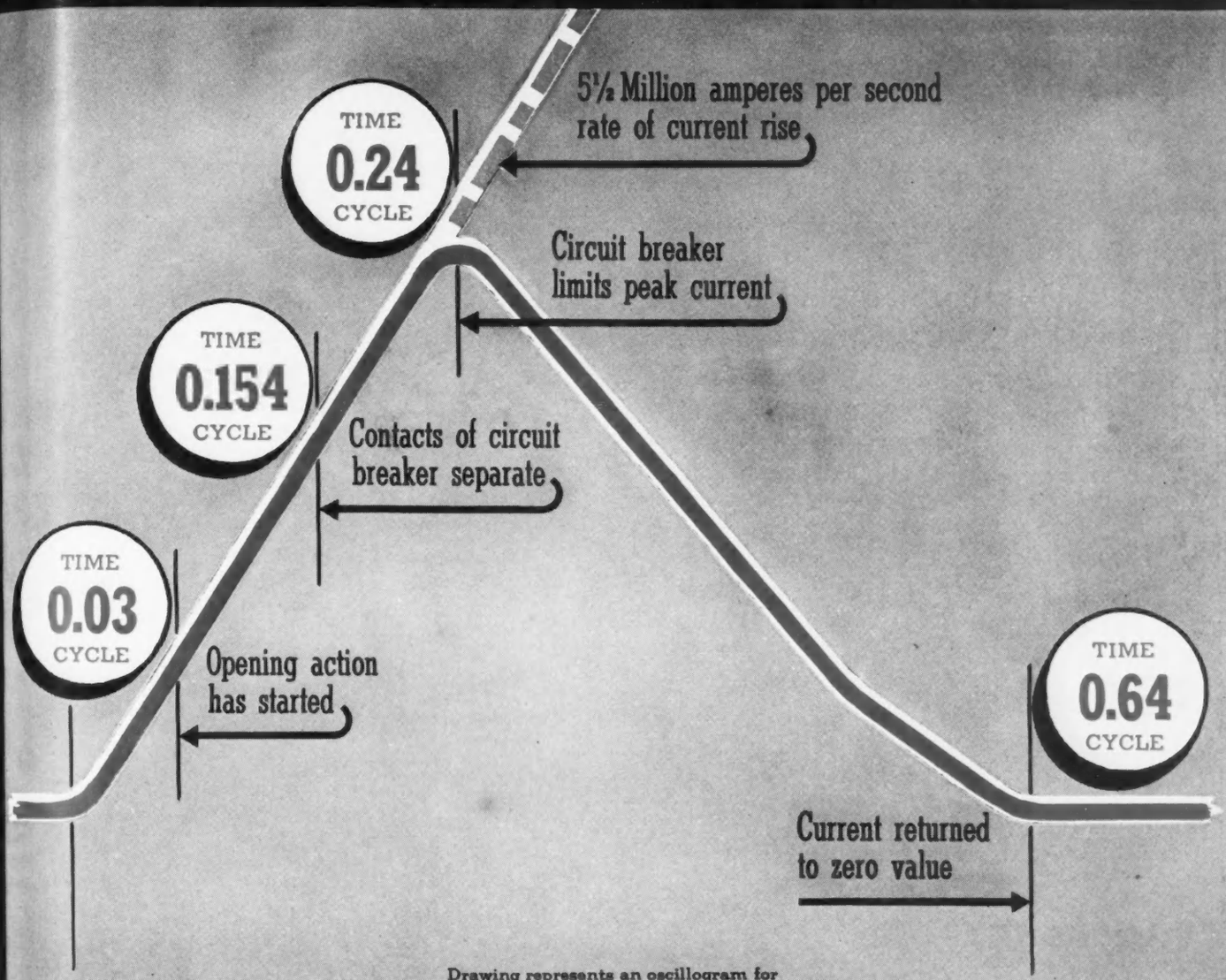
★ **These companies have supplied additional buying information on their products in the 1942 edition of the Electrical Buyers' Reference**

Circuit Breakers that Really Open Fast



Drawing represents an oscillogram for
I-T-E Type DB-2 Circuit Breakers
CYCLE = 1/60 second

Far Surpassing the Best of Conventional Speeds

The fastest of conventional circuit breakers are capable of completing their opening action in approximately 1 cycle. Peak current is limited, in what is even now the best of common practice, to values attained in a period of about ½ cycle.

When engineers in industry were laying plans for using mercury-arc rectifiers arranged in parallel, the best of conventional opening speeds was foreseen to be inadequate for protection against backfires.

The I-T-E staff worked closely with engineers who were facing the new protective problem . . . . and the I-T-E Type DB-2 circuit breaker was the result.

Opening characteristics of the new circuit breaker are indicated above. Current rising at the rate of 5½ million amperes per second is limited, in this typical application, to the entirely safe value of 22,000 amperes. Peak current is reached in the record time of just less than ¼ cycle.

I-T-E will gladly send to engineers who identify themselves and their companies, copies of Bulletins 4205 and 4206 in which the circuit breaker and the application are described as fully as present conditions permit.

I-T-E

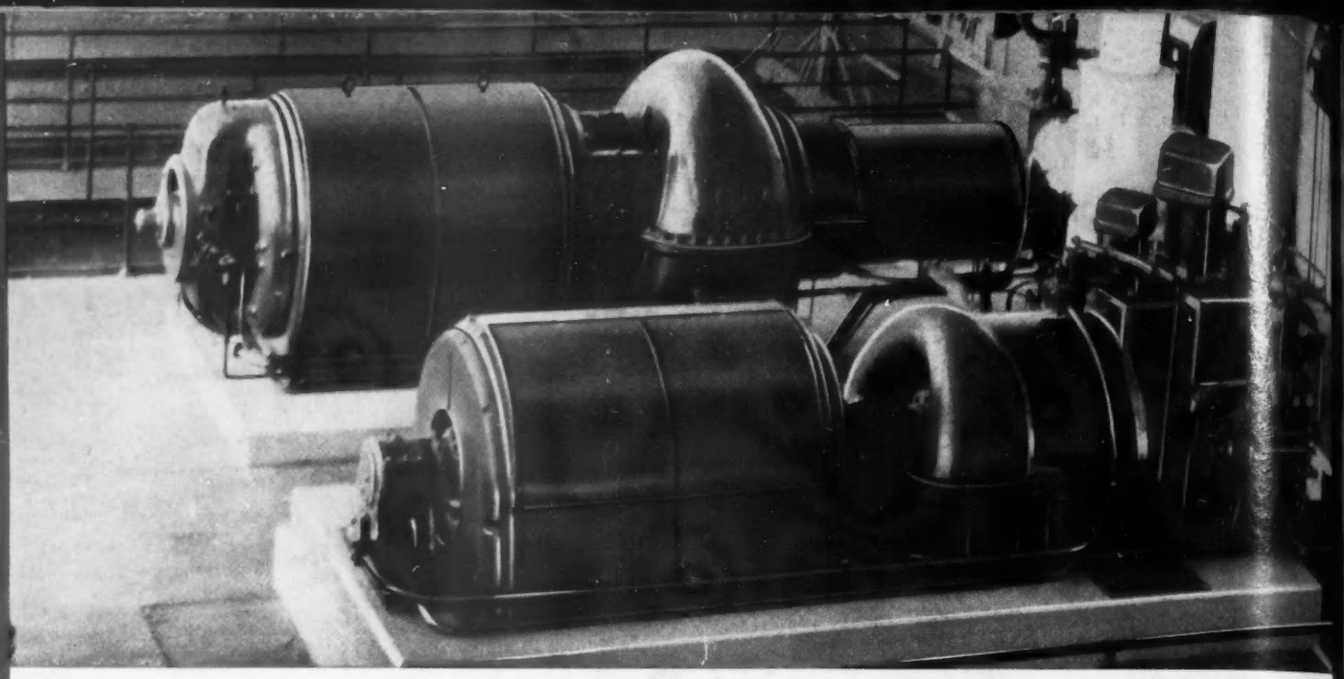
AIR SWITCHGEAR

IMMERSED IN AIR • ENCASED IN STEEL

Representatives in Principal Cities

CIRCUIT BREAKER CO., PHILADELPHIA, PA.

BRICATION ENGINEERING...LUBRICATION ENGINEERING...LUBRICATION ENGINEERING...LUBRICATION ENG



NOW, MORE THAN EVER, YOU NEED THE

Protection OF NONPAREIL TURBINE OIL

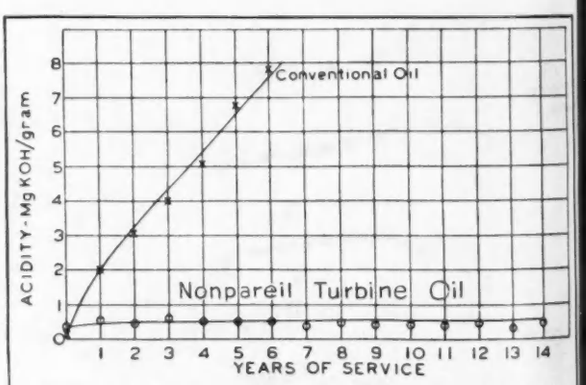
- **Protection against shutdowns for cleaning governors and turbine oil system.**
- **Protection against bearing corrosion and excessive wear.**
- **Protection against formation of oil sludge and emulsions.**

SUCH PROTECTION definitely contributes to your all-important Victory effort to increase power output with less labor and maintenance. There are several reasons why Nonpareil gives you this added protection.

Nonpareil is a highly refined white viscous oil with asphaltic constituents removed and certain patented inhibitors added to retard oxidation and formation of acidity.

The chart at right shows a comparison between acidity formation in conventional turbine oils and in Nonpareil, taken from records on hundreds of turbines. From similar data, it was determined that Nonpareil would last indefinitely in a turbine without oxidizing to produce high acidity, sludge formation, and loss of demulsibility.

Nonpareil Turbine Oil is the only oil *guaranteed in writing* to last as long as your turbine. Let a Standard Lubrication Engineer fully explain this guarantee and what it may mean to you. Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago, Illinois, for the Engineer nearest you.



Comparison of acidity development between conventional oils and an inhibited turbine oil (Nonpareil) on all types of service. It shows the superior resistance to acid formation of Nonpareil even after 14 years of service.

OIL IS AMMUNITION — USE IT WISELY

Copr. 1942, Standard Oil Company

STANDARD OIL COMPANY (INDIAN